Leader Phabrix

Leader

PHABRIX®

Leader Scopes

On-set Production Guide

About this Guide

This Guide has been created to describe how Leader Test and Measurement products are deployed and utilized throughout the broadcaster workflows. This guide describes the various on-set workflows that broadcasters utilize and how Leader Test and Measurement products can simplify workflows and improve efficiencies whilst continuing to deliver the highest quality programming.

Notice

The information in this document has been produced by Leader Electronics Corporation with care and is believed to be accurate. Leader Electronics Corporation does not assume responsibility for loss or damage resulting from errors, omissions or inaccuracies herein. This document is subject to change. Revisions may be made and issued to include such changes.

Contents

Leader Scopes *1*
About this Guide *2*
Notice *2*
Introduction *4*
Leader Scope - On-Set Production *5*
Why do we need the classic waveform monitor and vector scope on-set? *8*
Why you need a waveform monitor in pre-production Setting Black and White Camera Levels *10*
Camera White Balance 10
Camera Black Balance 13
Setting 18% Middle Grey *20*
RGB Vector Display *24*
Checking the Color Values with a Vector Scope *29*
What is the purpose of the Vectorscope Display? *30*
What is the purpose of the Histogram Display? *32*
How to read a Histogram Display 32
Why you need a waveform monitor in during production *35*
Aspect Marker Display *35*
Aspect Shadow 36

Safe Action Markers 36
Safe Title Markers 37
CINELITE and CINEZONE *37*
CINELITE *37*
CINELITE Advanced *38*
CINELITE f-Stop Measurement *38*
CINEZONE *41*
CINEZONE - Under exposed image / Low light images *41*
CINEZONE - Chroma key / Greenscreen setup *42*
Onset HDR-SDR Color Pipeline *43*
CINEZONE high dynamic range (HDR) *47*
CINESEARCH *49*
Color and Gamut *50*
Extended Gamut Display *52*
Measurement of external sync signal *53*
AV delay (lip-sync) error measurement *54*
Simultaneous picture monitoring *54*
Capture *55*
Leader ZEN series – LV5350 Waveform Monitor *56*
LV5350 Waveform Monitor – Ordering Guide 57
Leader Zen Series – LV5300A/LV5350 Hardware Options *58*
V-Mount Battery Adapter (SER11) *58*
QR Gold Battery Adapter (SER12) *58*
Rack Mount-Kit (LR2530 & LC2535) *58*
Leader Zen Series – LV5300A/LV5350 Software Options *59*
Audio Analysis (SER20) *59*
CIE Color Chart (SER22) *59*
HDR Analysis (SER23) *60*
SDI Test Pattern Generator (SER24) *61*
Focus Assist (SER25) *61*
Customizable Layout (SER26) *62*
12G/6G-SDI Analysis (SER28) *62*
Extended Vector Display (SER40) *63*
Monitor Display Outputs – LV5300A/LV5350 ..... *64*

Introduction

The continued rapid growth of high-end scripted programming for OTT streaming platforms such as Apple, Disney, Netflix and Amazon Prime Video has driven the adoption of feature film production techniques across television and streaming workflows. While these productions often have substantial budgets, they rarely match the financial scale of major theatrical releases. As a result, production teams must balance cinematic production values with strict cost control.

One effective approach to achieving this balance is robust on-set technical monitoring. By identifying and correcting technical or colour-related issues during capture, productions can avoid costly delays and remediation in post-production, reducing reliance on the traditional “fix it in post” model.

Increasingly, productions are implementing the Academy Color Encoding System (ACES), developed by the Academy of Motion Picture Arts and Sciences, to maintain colour consistency across the entire production pipeline. From image acquisition through editing, visual effects, mastering, distribution and long-term archiving, ACES provides a unified colour management framework that preserves the filmmaker’s creative intent.

This white paper examines how productions are supporting these workflows by using the Leader ZEN Series waveform monitors. By bringing the same UHD and HDR measurement tools used in post-production grading suites onto the set, production teams gain immediate visibility into image quality—enabling efficient workflows and consistent delivery of premium OTT content.

Leader Scope - On-Set Production

Prior to the advent of digital cameras, all cinema and hi-end television (HETV) production used film, and the only real format choice was whether you used 35mm or 70mm. The original print, shot on film, was available for eternity, but with the advent digital cameras everything changed.

Prior to the introduction of digital cameras, on-set production was relatively simple. Each day during filming, the Director of Photography (DoP) and the camera crew would arrive early on set and rehearse. Working with the director, the DoPs finalized blocking (decide the exact movement of both actors and camera). They discuss special camera moves or lighting requirements with the camera operator, gaffer and grip. Each shot is marked up for focus and framing by the focus puller and then the DoP oversees the lighting of the set for the first take.

It's the job of the DoPs to make sure every shot is usable and flag them when they're not and it wasn't typically until the following day that the DoP would be able to review the dallies rushes (raw footage) with the director, prior to making the rushes available for the colorist in post-production.

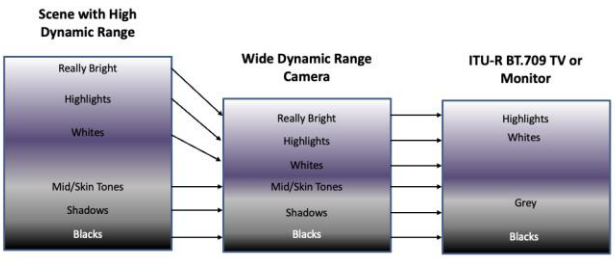
With digital cameras, everything has changed. Firstly, the new breed of digital film cameras all come with individual manufacturer specific formats. Which is okay if you are using the same cameras throughout the production but that is highly unlikely, and you now have the issue of matching different cameras with manufacturer specific attributes.

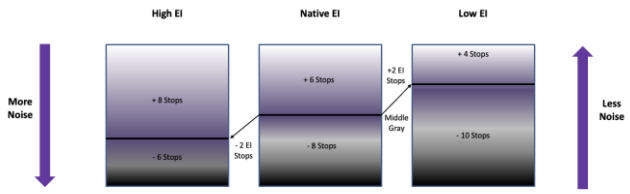
You also have now the instant availability of rushes to view on set. So where previously the DoP and Director would review yesterdays dallies, now they are no longer the only people on-set who can review the rushes.

To the uninitiated, on-set monitoring of cameras on a feature film / high-end television production can appear bemusing. Since the advent of log-based gamma curves on mainstream cameras, more productions are now working with log-based curves. With cameras set to the manufacturer's native exposure index (EI), to the uninitiated this image looks under-exposed when viewed on a standard monitor without any lookup tables. The assumption therefore is that it is under-exposed or in some way too dark to ever look right, because that is what production staff who are familiar with working with conventional gammas have come to expect.

To try and reassure production staff, it is not unusual for a lookup table to be added, which converts the log to a REC-709 type gamma and now the image looks brighter, but as it now must fit within REC-709 space, some of the high end or low end are lost, so we no longer see the full range of the captured image.

Another method is to overexpose to produce a brighter image. Exposing log brighter makes no difference to the dynamic range; that is determined by the sensor and the gain point at which the sensor is working. Ideally you want the camera to be at its native sensitivity or 0dB gain to ensure that you obtain the maximum dynamic range.





Exposing brighter or darker does not change the dynamic range but it does move the mid-point of the exposure range up and down. Exposing brighter increases the under-exposure range but decreases the over exposure range. Exposing darker decreases the under-exposure range but increases the over-exposure range.

Accurate on-set monitoring of cameras on feature films and high-end television productions is essential if additional production costs are to be avoided in post-production. Unlike studio-based production where a vision engineer has access to all the cameras, and producers and directors can view camera images live, feature films and high-end television productions rely on a select number of people to ensure that the camera setup is correct.

A key factor in ensuring that all the cameras are set up correctly, data is successfully backed up and quality is maintained, is the Digital Imaging Technician (DIT), but who are DITs and what do they do?

The (DIT) is a relatively new position within the on-set production community and is the connection between on-set time and post-production. The role has evolved following the introduction of digital cinema cameras and digital media.

The DIT is a member of the camera department crew and collaborates with the director of photography (DoP) to ensure that the agreed 'look and feel' of a production is achieved digitally. The DIT's role on set has become especially prevalent through assisting cinematographers, normally accustomed to film stock, in achieving the desired look digitally. This is accomplished by the DIT through monitoring picture exposure, setting up a color decision list (CDL) daily and, if required, look-up tables (LUTs) for post-production. Additionally, the DIT will deal with settings in the digital camera's menu system, such as recording formats and outputs.

As well as assisting the DoP, the DIT is responsible for managing data on set, such as making backups and quality checks of the material. In post, the DIT hands the recordings to the postproduction team after checking the quality of the material and generating working copies. Data backups and quality control are of major importance to the DIT, who must make sure that the original camera data and metadata are backed up at least twice daily, ensuring data integrity with checksum verification. Data backups are made to LTO tape as a long-term backup as well a copy on a transfer data carrier that will be sent to postproduction along with reports of the contents. For insurance purposes, at least three separate copies of the recorded data are made by the DIT. The DIT is also responsible for making the data recording accessible at all times on-set for review.

On larger productions, the DIT may be assisted by a data wrangler who acts in a supporting role for managing, transferring and securing all digital data acquired on-set via the digital cinematography cameras and interacting with the second assistant cameraman.

And finally, the DIT is also responsible for securing the digital audio recorded by the external digital audio recorder operated by the production sound mixer.

For productions in some regions, it is not the job of the Camera Crew to provide playback for Directors, Producers, Clients, Executives, Script Supervisor or any department other than the Camera Department.

The Camera Department may provide direct playback from the camera when it is technologically the only possible way for non-camera personnel to view the image, such as ultra-high speed or time-lapse

photography.

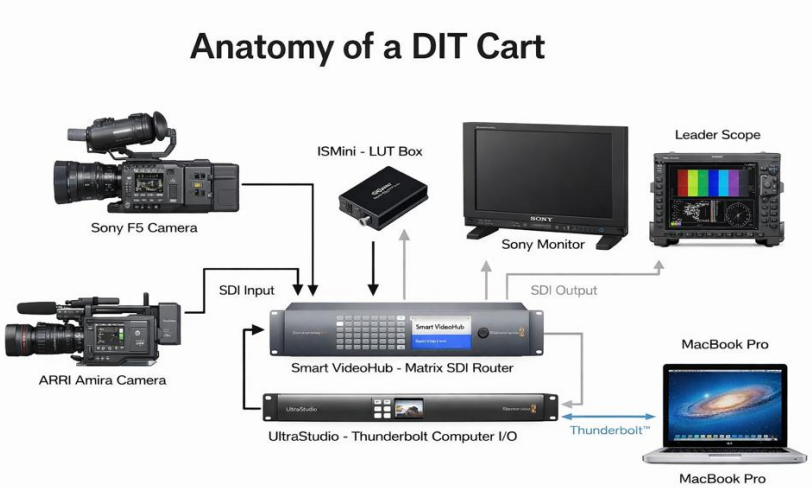
Failure to staff appropriately on the part of the Producer should not be considered a valid reason for the Camera Department to perform playback.

Other than the examples cited above, playback is traditionally and historically the exclusive jurisdiction of a Video Assist Technician.

How does a DIT manage to perform all these tasks?

As DITs must operate in a variety of locations, most of them use a cart to house their equipment.

Courtesy of Michele deLorimier – DIT, VC & Phantom Tech



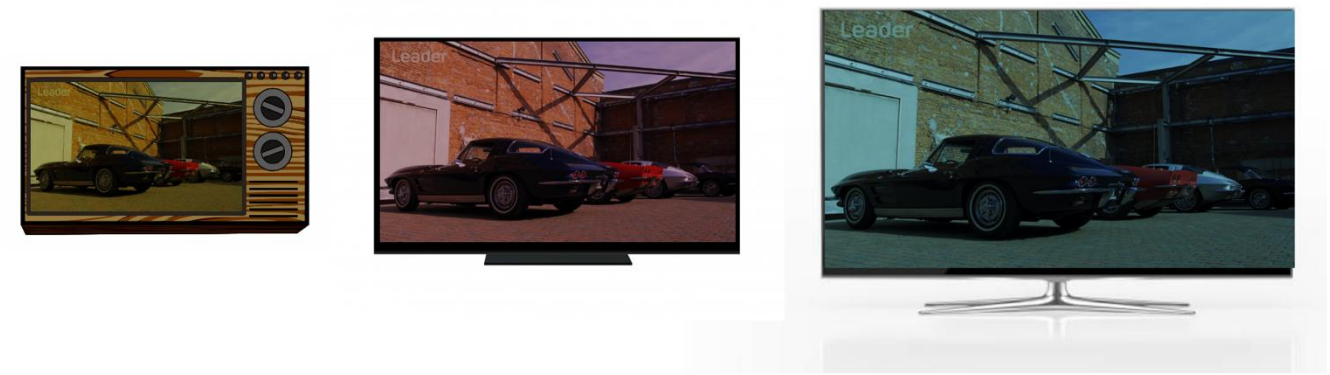
The Leader Scope has become synonymous with DITs around the world. Its compact form-factor and ability to operate with both AC and DC power sources, make it ideal for all production environments. Not only does it give you all the classical 'real-time' test and measurement tools you expect, like picture

monitor, waveform display and vector scope in a multi-view display, the Leader scope features a number of 'real-time' analysis displays, that make it prefect for 'on set' production.

Why do we need the classic waveform monitor and vector scope on set?

A waveform monitor on set allows you to detect errors that are not visible on a traditional monitor.

Monitors can look different due to the amount of light reflection on the screen or how the monitor is calibrated. Having a waveform monitor that allows you to detect errors that you cannot see on monitor. This is essential, if you don't want to spend more time and money in postproduction carrying out technical fixes.

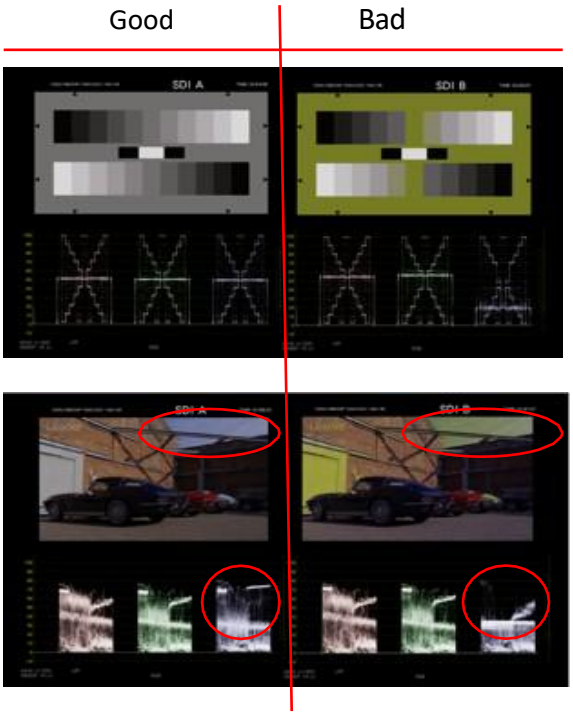


Therefore, you need to have a device on-set that lets you see exactly how the camera is decoding to **Red**, **Green** & **Blue** (**RGB**) channels.

The classic waveform display is still used on set to ensure that, before production commences, all of the cameras are correctly set up and match each other.

To maximize and benefit from High-end TV (HDTV) production, you really should understand the benefits that a waveform monitor can bring.

Not only should the camera be correct setup to accurately reproduce the image being captured, if multiple cameras are being used then they should also match, otherwise you could encounter unwanted delays and additional production costs whilst technical fixes are carried out in postproduction.

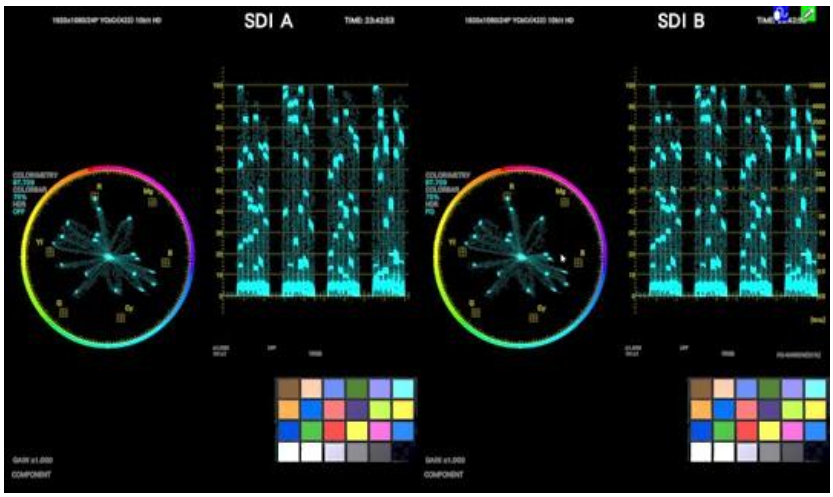


This is achieved by checking the RGB balance using a waveform and grey-scale chart.

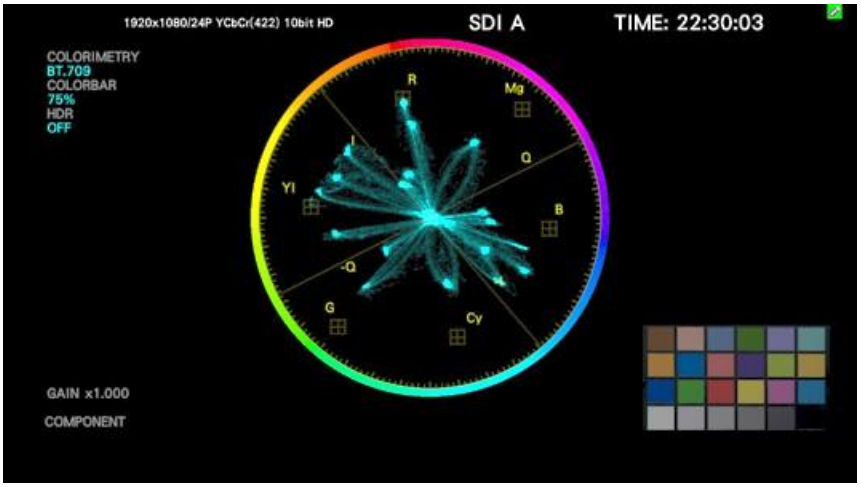
The **Blue** channel is compressed into the bottom half of the waveform display, and the detail has been lost in the highlights.

The classic vector scope display supplements a waveform display to visualize chrominance, which is encoded into the video signal to drive the display. The actual pattern that the incoming chrominance signal draws on the vector scope is called the *trace*. The vector scope graticule roughly represents saturation as distance from the center of the circle and hue as the angle.

The graticule is also embellished with several elements corresponding to the various components of the standard color bars video test signal, including boxes around the circle for the colors in the main bars and perpendicular lines corresponding to the U and V components of the chrominance signal.



Vectorscope and waveform display matching (2) two cameras



Vectorscope and picture display

Why you need a waveform monitor in pre-production

Setting Black and White Camera Levels

Camera White Balance

White balance is a setting that tells your camera how to register color temperature. White balance is used to adjust colors to match the color of the light source so that white objects appear white. Subjects may be lit by a number of different light sources, for example fluorescent light may cause video footage to have a green hue overlay, while warm light sources, such as sunlight and incandescent bulbs can portray an orange and yellow hue over the video footage.

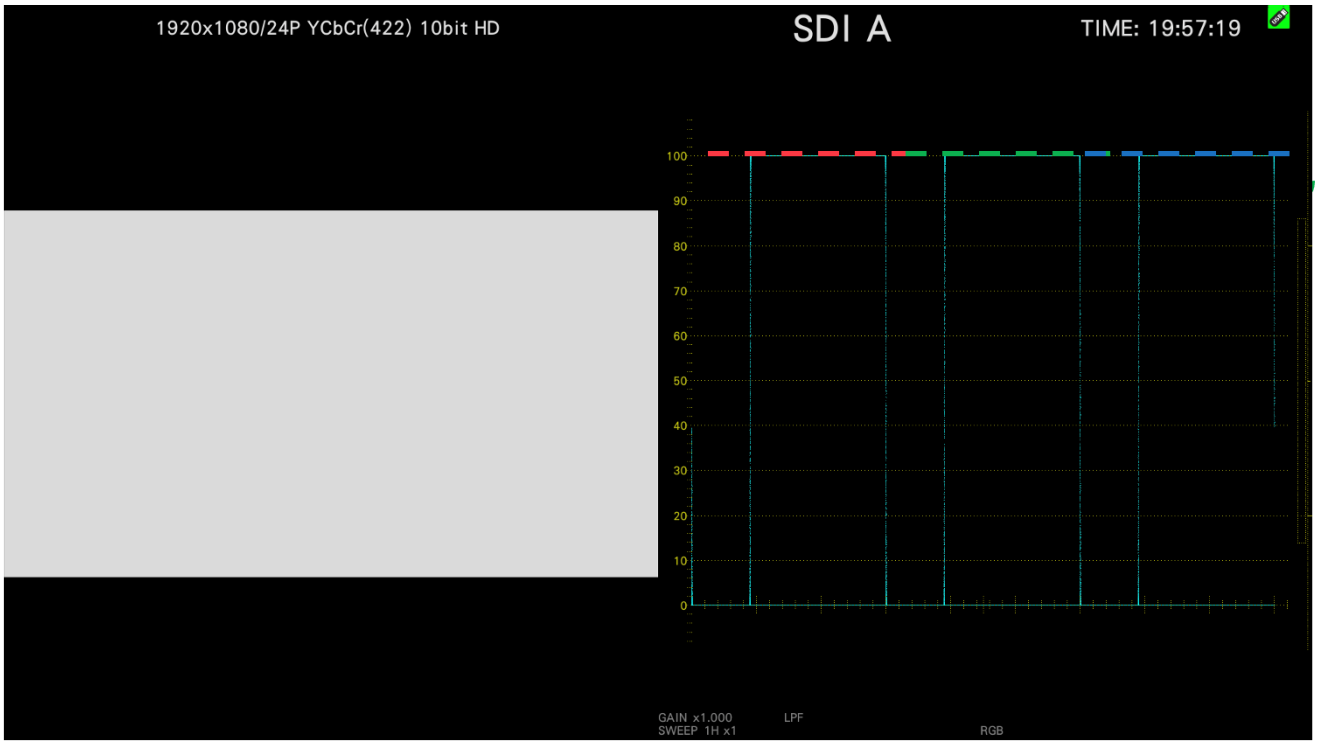
Therefore, in order to obtain the same colors under each different light source, this variation must be compensated for electrically by adjusting the settings of the camera.

For example, image shooting a white object.

The ratio between **Red**, **Green** and **Blue** channels of the camera video output must be 1:1:1 to reproduce white. This ratio must stay the same under any light source (when shooting a white object).

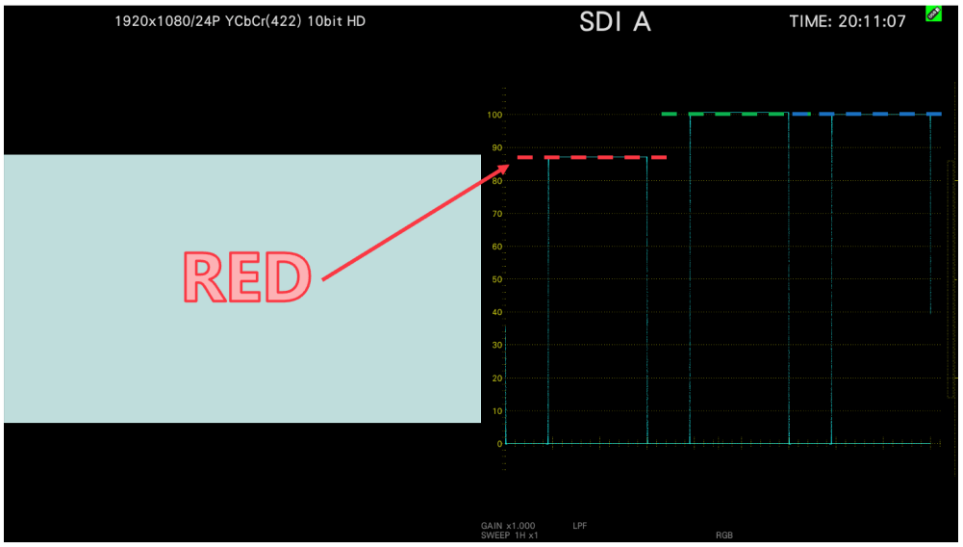
Digital Film Camera

The waveform monitor display allows onset monitoring of exactly how the camera is set up to decode **Red**, **Green** and **Blue** channels

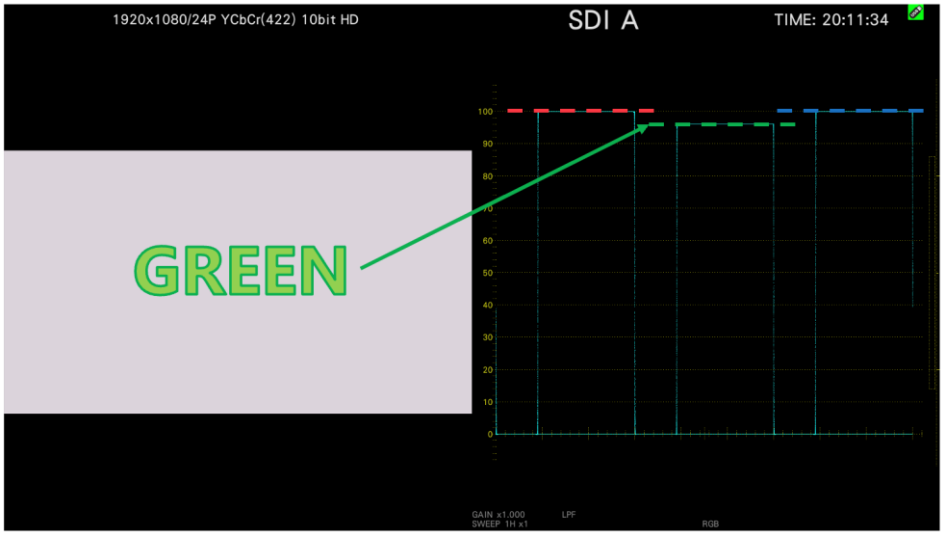


White Balanced picture and waveform display

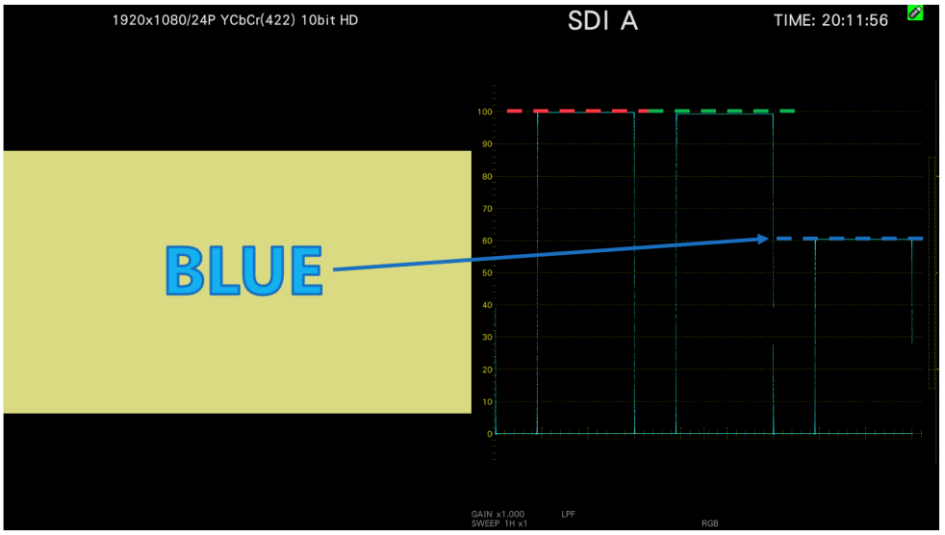
If the camera is incorrectly set up, white will not appear white and have a tint to it, as can be seen from the examples below.



White Balanced – Red incorrectly setup



White Balanced – Green incorrectly setup



White Balanced – Blue incorrectly setup

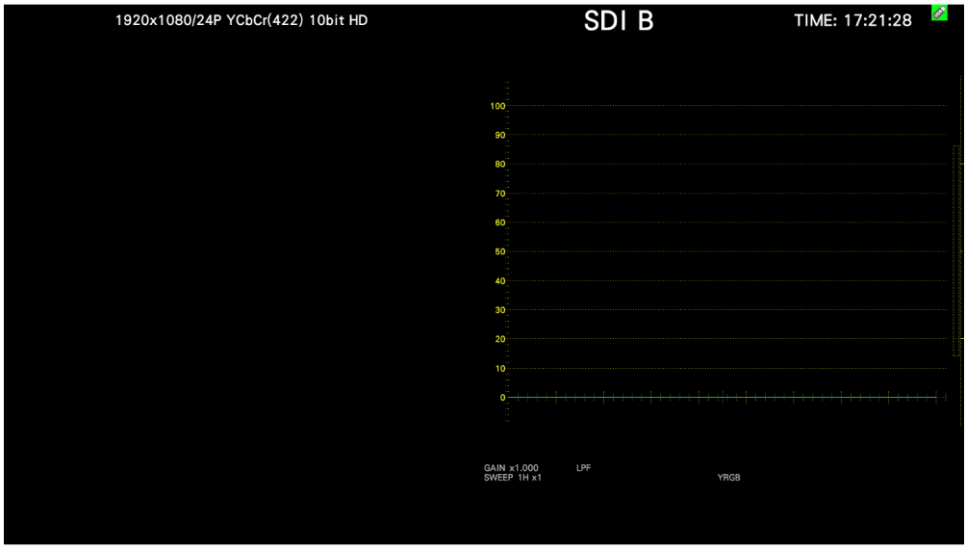
Camera Black Balance

To ensure accurate reproduction from the camera, it is imperative that the camera reproduces a true black when the lens is closed, otherwise a colorcast (a tint of a particular color) may be seen. Like the white balance, this requires accurate matching of the Red, Green and Blue black levels.

Digital Film Camera

It will also ensure that any ‘hot pixels’, that are not visible on the camera viewfinder are corrected before shooting, otherwise they will have to be ‘fixed in post’ which will require additional time and increase postproduction costs.

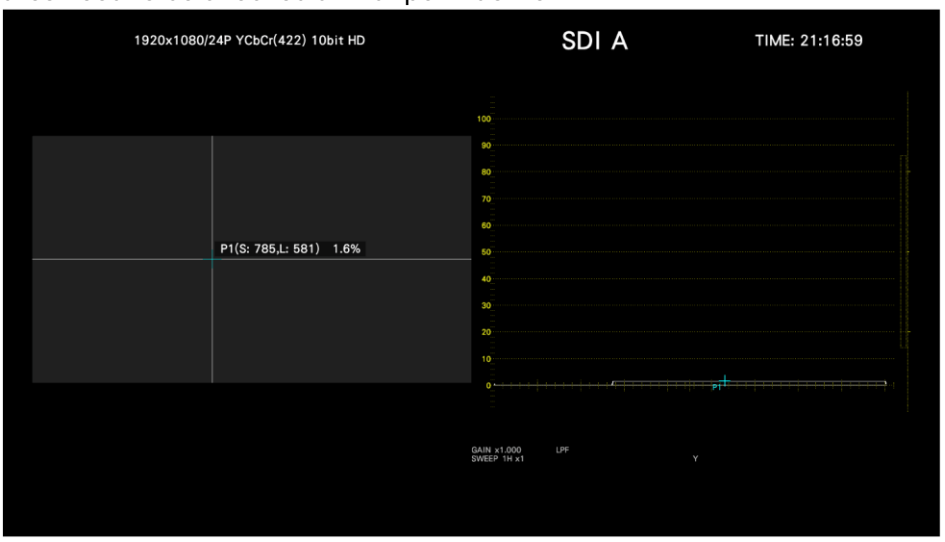
The waveform monitor display allows onset monitoring of exactly how the camera is set up to decode **Red**, **Green** and **Blue** channels



Black Balanced picture and waveform display with Black set to ‘0%’

If black is set to '0', crushing cannot be picked up by a waveform monitor and can affect the tracking as well. If one color is crushing at black, the chip does not turn on at the same time as the others to begin its journey to white.

Therefore, it is recommended to set black at 1-2 then balancing for black. Then it can be dialed down to 1 or even zero but flares need to be checked at that point as well.



Black Balanced picture and waveform display with Black set to ‘1.6%’

Unlike white balance, black balance does not need to be adjusted every time however, if you are frequently changing your shooting environment from hot climate to cold or visa-versa, cameras sensors are sensitive to heat, so black balancing should be carried out. It’s also recommended to black balance a camera if the

camera has been subjected to high altitudes, like on a flight, as the camera sensor will be subjected to more cosmic rays at high altitude.

You should adjust the white balance both before and after adjusting the black balance

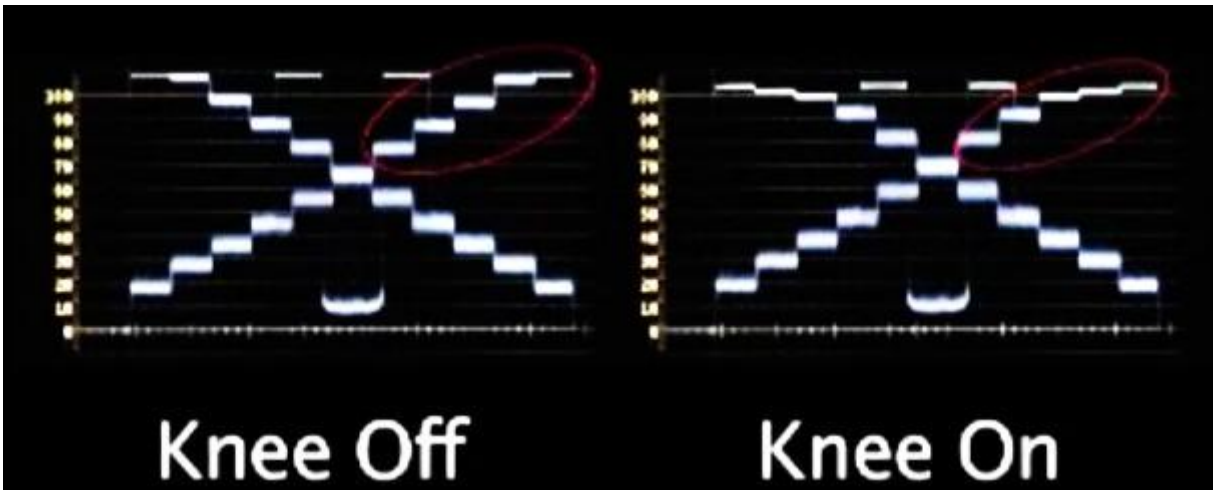
Always consult your lens and camera manufacturers setup instructions to ensure that the lens and camera are correctly set up for calibrating the 'Black Balance'. Ensure that the camera **Knee Correction** and **White-Clip** are switched off and **Gamma** settings are correct, and the lens is set to the correct F-Stop setting.

Knee Correction - When we take a photo against a strong backlight, just like shooting a portrait picture in front of a sunlit window, we can still clearly see the subject's face while being able to see the details of scenery outside the room. This is because the human eye can handle wide dynamic range.

However, this is not easily done by video cameras because of the limited video-level dynamic range specified by the television standards. Therefore, if the camera lens iris was adjusted for correct exposure of human skin tone, the bright areas of the image would not fit into the video-signal range and would be washed out. Conversely, if the iris was adjusted for the bright areas, the video level of human skin tone would be very low and look too dark.

In order to obtain an image reproduction like the human eye, as naturally as possible, a function called '**Knee Correction'** is widely used on today's video cameras.

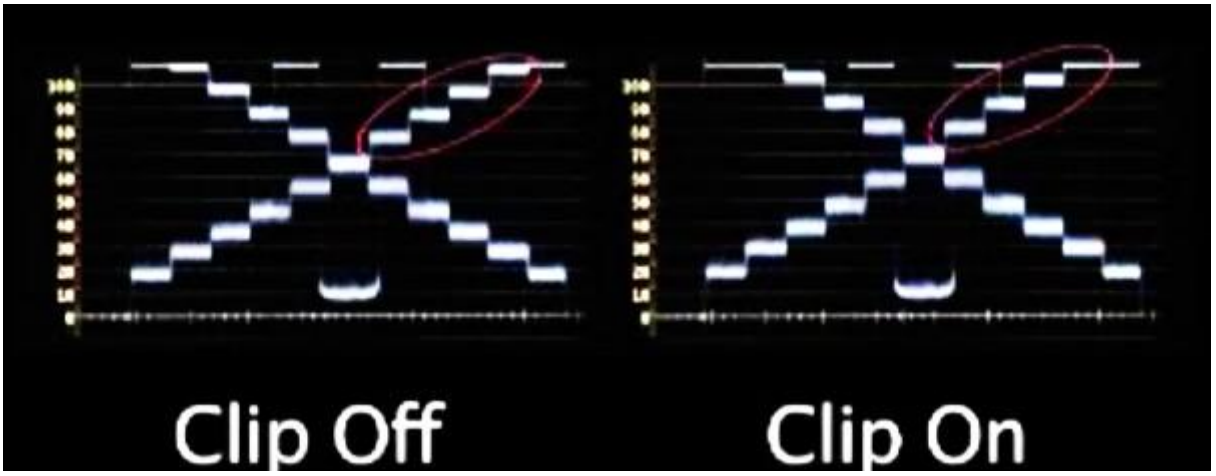
Knee Correction is a function that compresses the wide dynamic video signals acquired by the imager (CCDs) into the limited video-level range specified by the television standards. The video level from which signals are compressed is called the knee point.



Knee Correction 'OFF and 'ON' waveform display

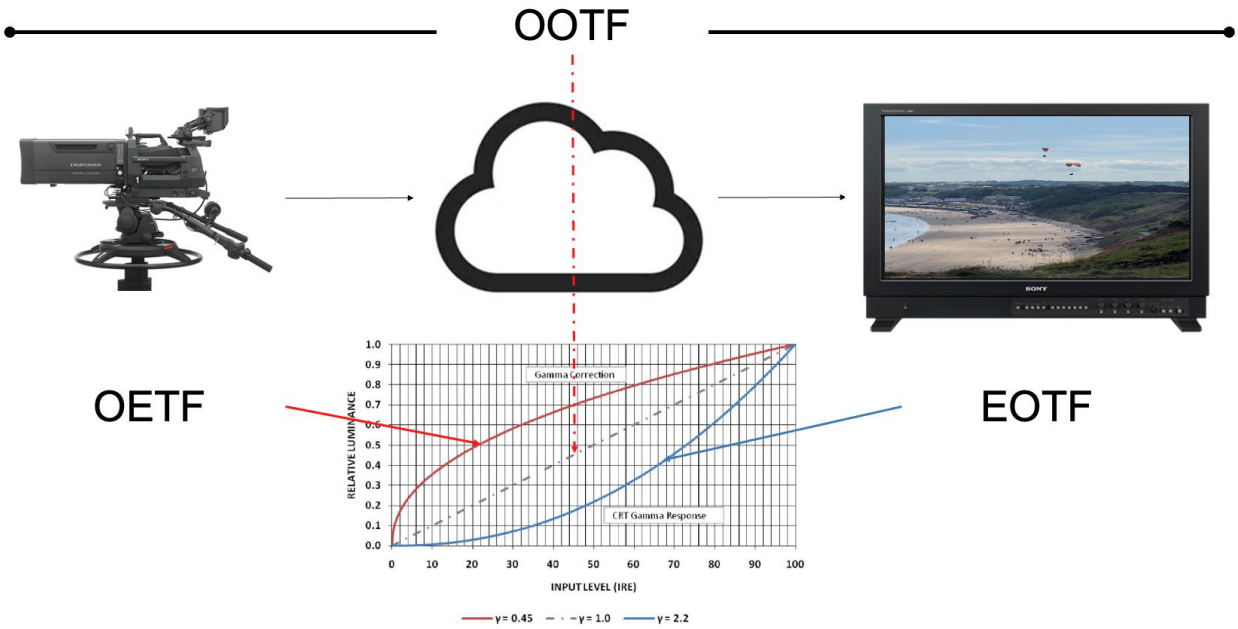
White-Clip - All cameras have **White-Clip** circuits to prevent the camera output signals from exceeding a practical video level, even when extreme highlights appear in a picture.

The **White-Clip** circuit clips off or electrically limits the video level of highlights to a level, which can be reproduced on a picture monitor.



White-Clip 'OFF and 'ON' waveform display

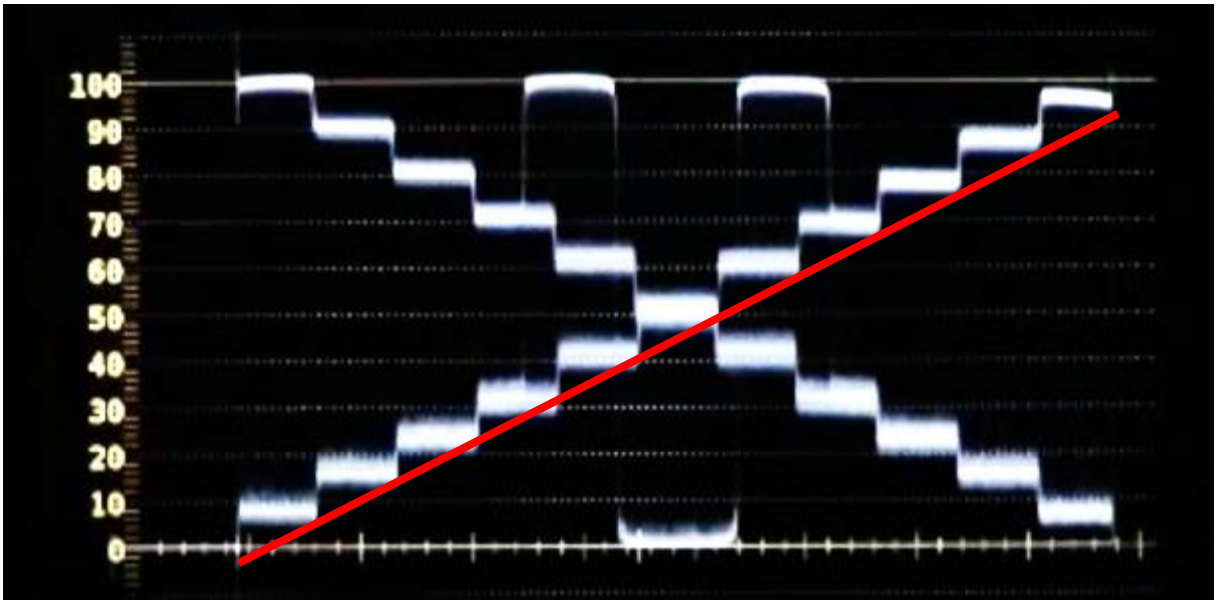
Gamma – It is a numerical value that shows the response characteristics between the image brightness of an acquisition device (Camera – Optical to Electrical Transfer Function (OETF)) or display device (CRT Monitor – Electrical to Optical Transfer Function (EOTF)) and its input voltage. The overall Camera-to-Display transfer function is referred to as the Opto-Optical transfer function (OOTF) and is sometimes referred to as 'Rending Intent'.



Camera to Display Transfer Function (OOTF)

While most cameras have a default **Gamma** of 0.45, most cameras allow you to adjust the gamma to uniquely stylizes results.

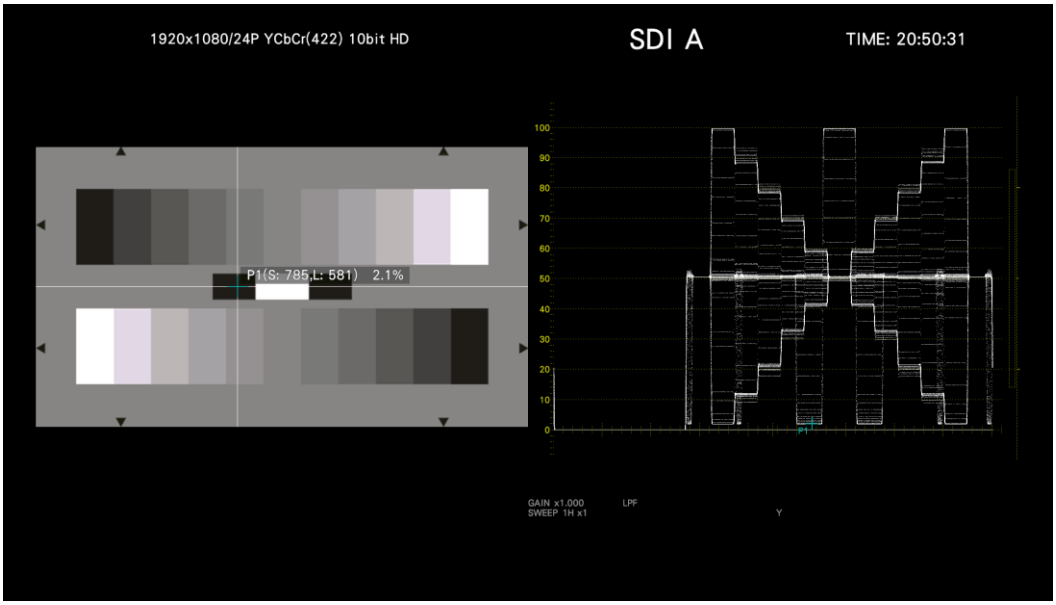
If the step across the screen reveals a straight line, this means that your **Gamma** is set correctly



Grey Scale Waveform Display

Again, you should be able to adjust this in your camera menu settings to preset that the camera contains. It is still highly recommended that you start from the default value and adjust it from there.

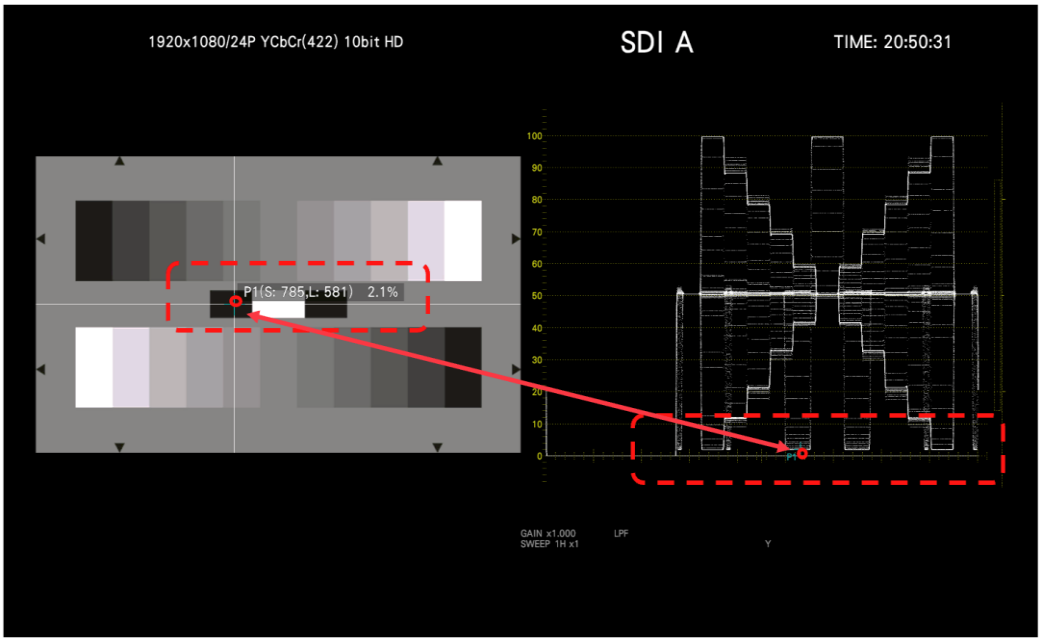
Leader waveform monitor includes as standard User-Defined Correction Tables. The default gamma correction value when measuring f Stop levels is 0.45, but you can also use a user-defined gamma correction table that matches the gamma characteristics of the camera that you are monitoring.



To ensure that the camera is correctly adjusted, productions will use a grey-scale test pattern chart to set up the camera. The grey-scale test pattern chart contains both **Black** and **White** tiles, as well as **Middle Grey**.

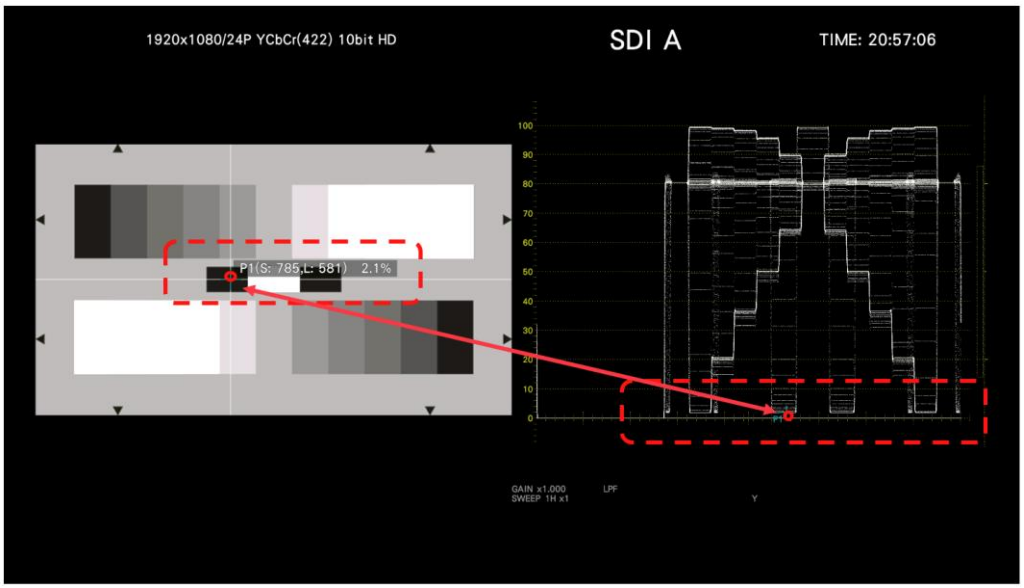
Grey-scale test pattern chart and waveform display

The black area of the image should correspond to '0' on the IRE scales.



Grey-scale test pattern chart and waveform display – Black

When the black balance on the camera has been set up correctly the black area of the image will continue to correspond to '0' on the IRE scales, even when opening the iris to 30% more than its original position.



Grey-scale test pattern chart and waveform display – Black

Just to clarify the 30% means the value of luminance. If the black level starts going up whilst opening the iris, that means your lens flair is off.

Setting 18% Middle Grey

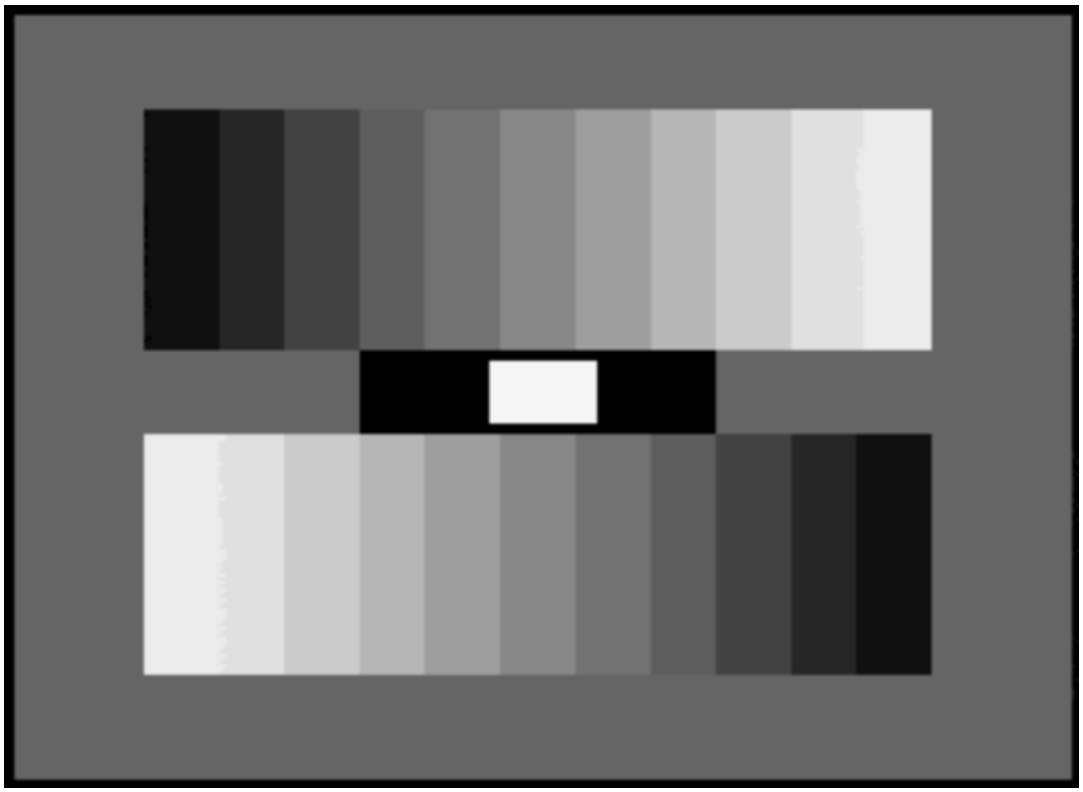
Having set the White and Black balance, we now need to set the ‘Middle Grey’. Middle Grey is halfway between, White and Black.

Digital Film Camera

This is traditionally set up using an 18% Grey Scale Chart.

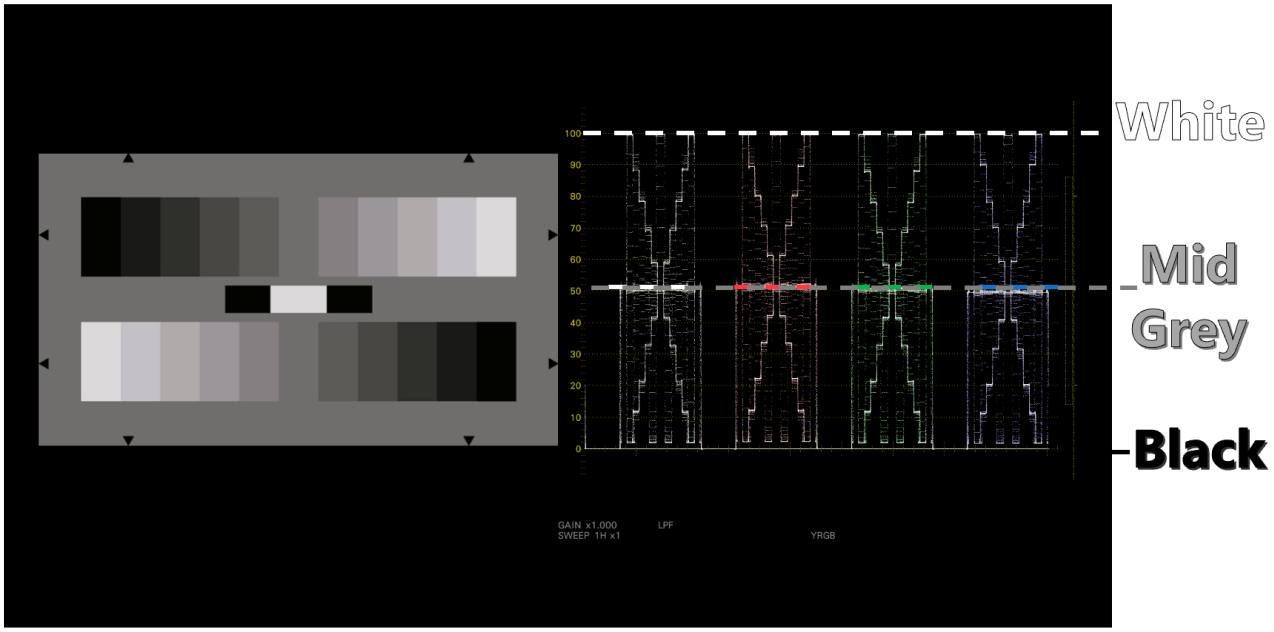
It’s called an 18% Grey Scale, because it reflects 18% of the light. Turn off on the camera the **Knee** and **White Clip**.

Greyscale Test Chart

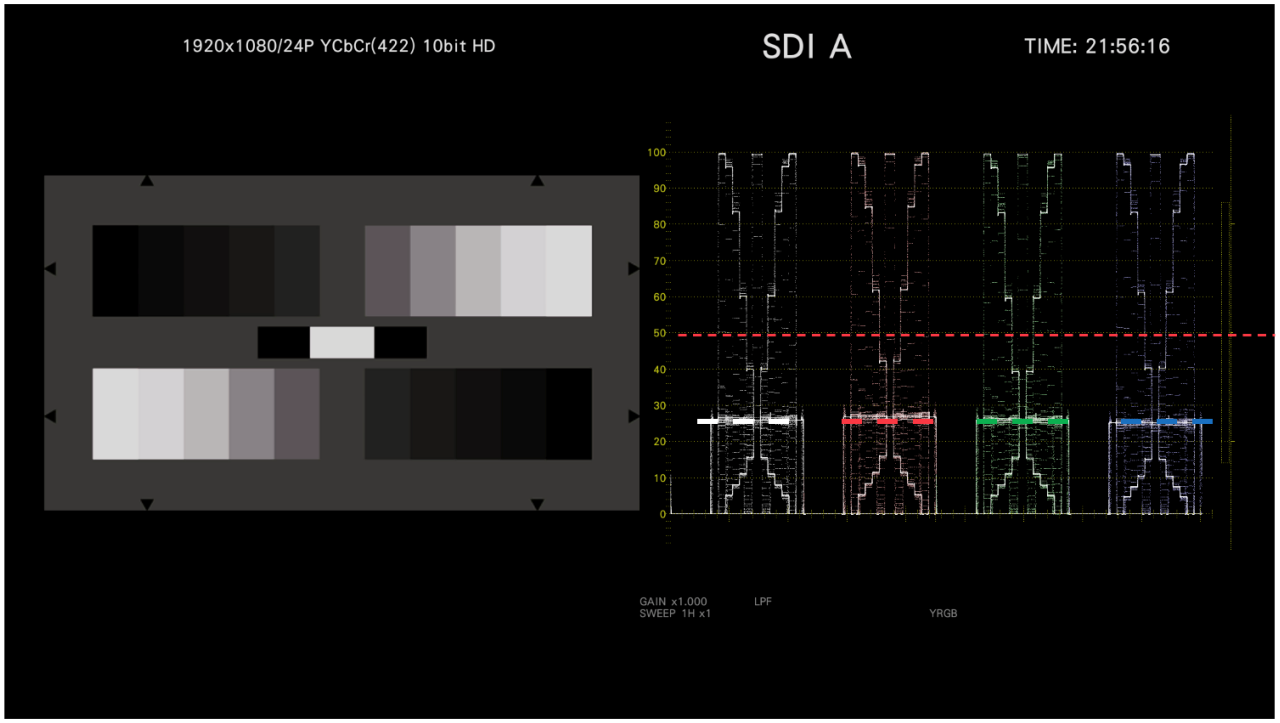


The main goal of this chart is to see a variety of neutral greys from pure black to pure white. There will never be a color tint in any of the bars. Greyscale test charts are used to fine-tuning color balance in cameras more concisely than White Balance.

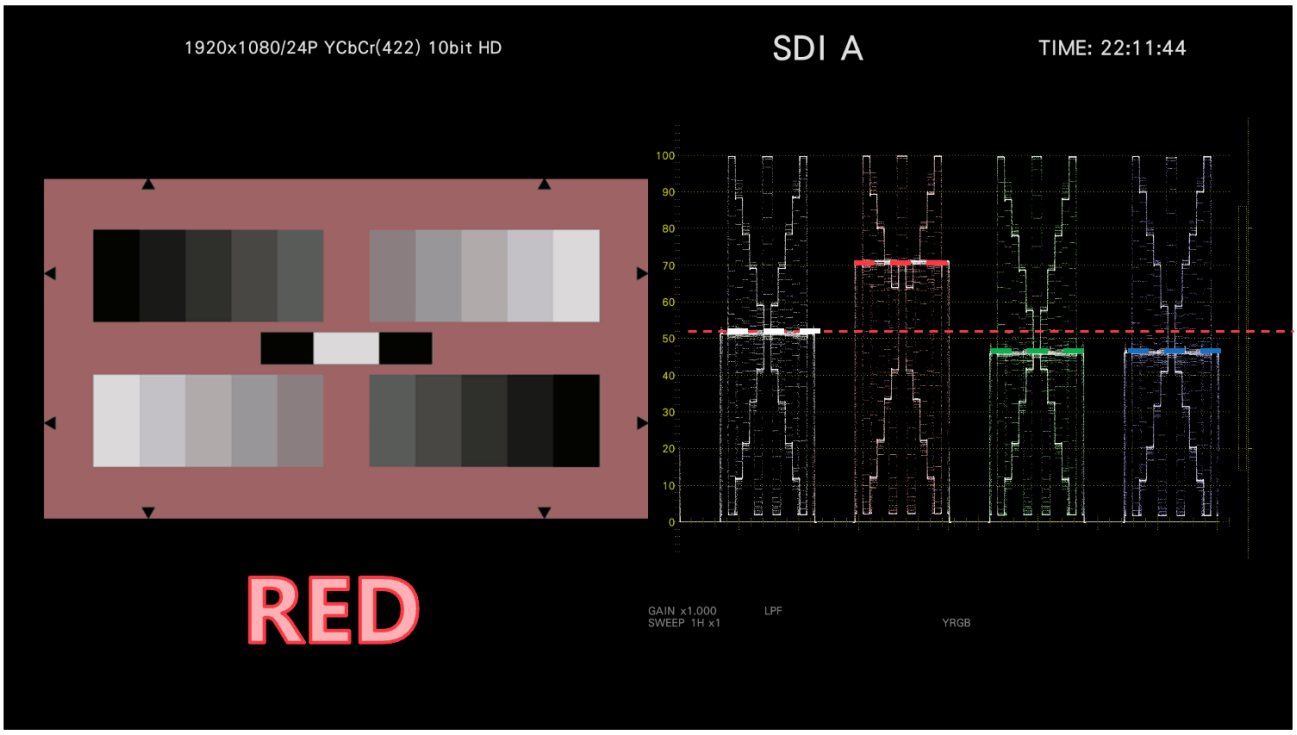
Again, as with White and Black balance you need to ensure that your camera's 18% middle grey is set correctly prior to any recording commencing and the only way to accurate achieve this is by using a waveform monitor on set.



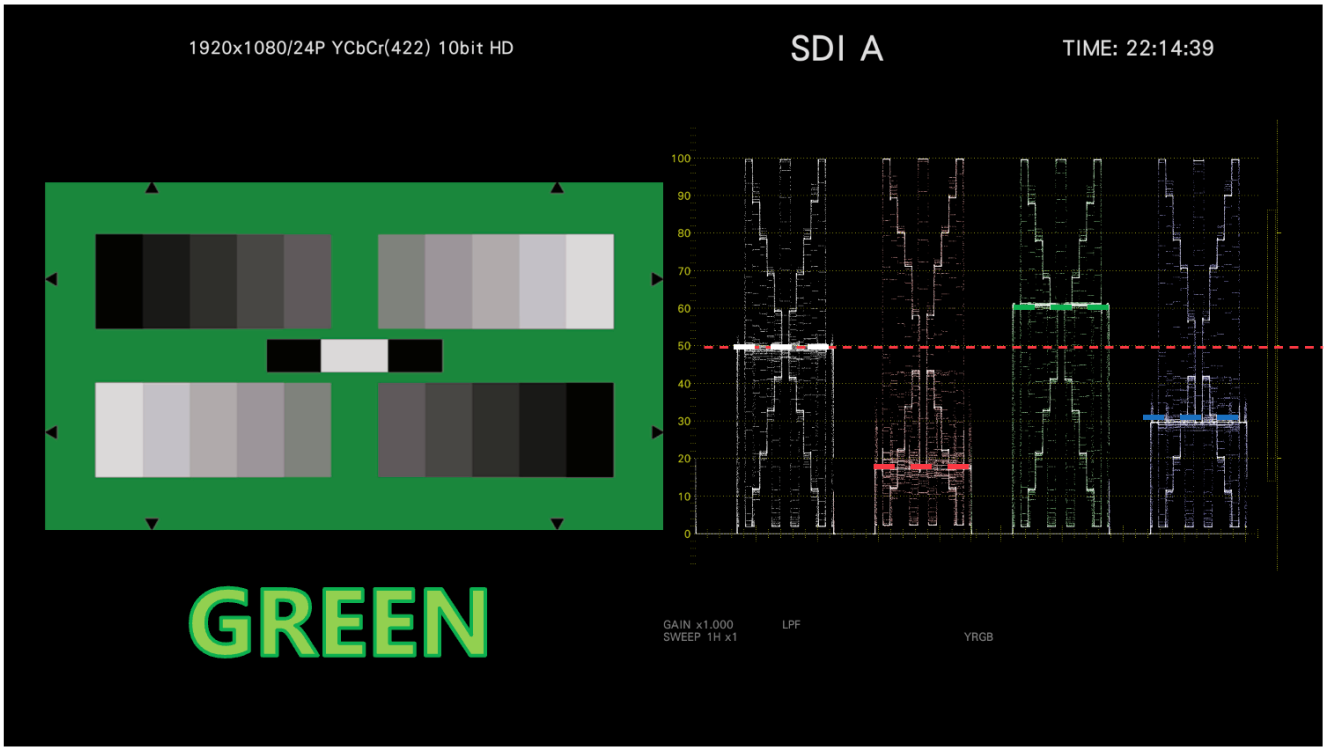
Greyscale Test Chart with Waveform Display



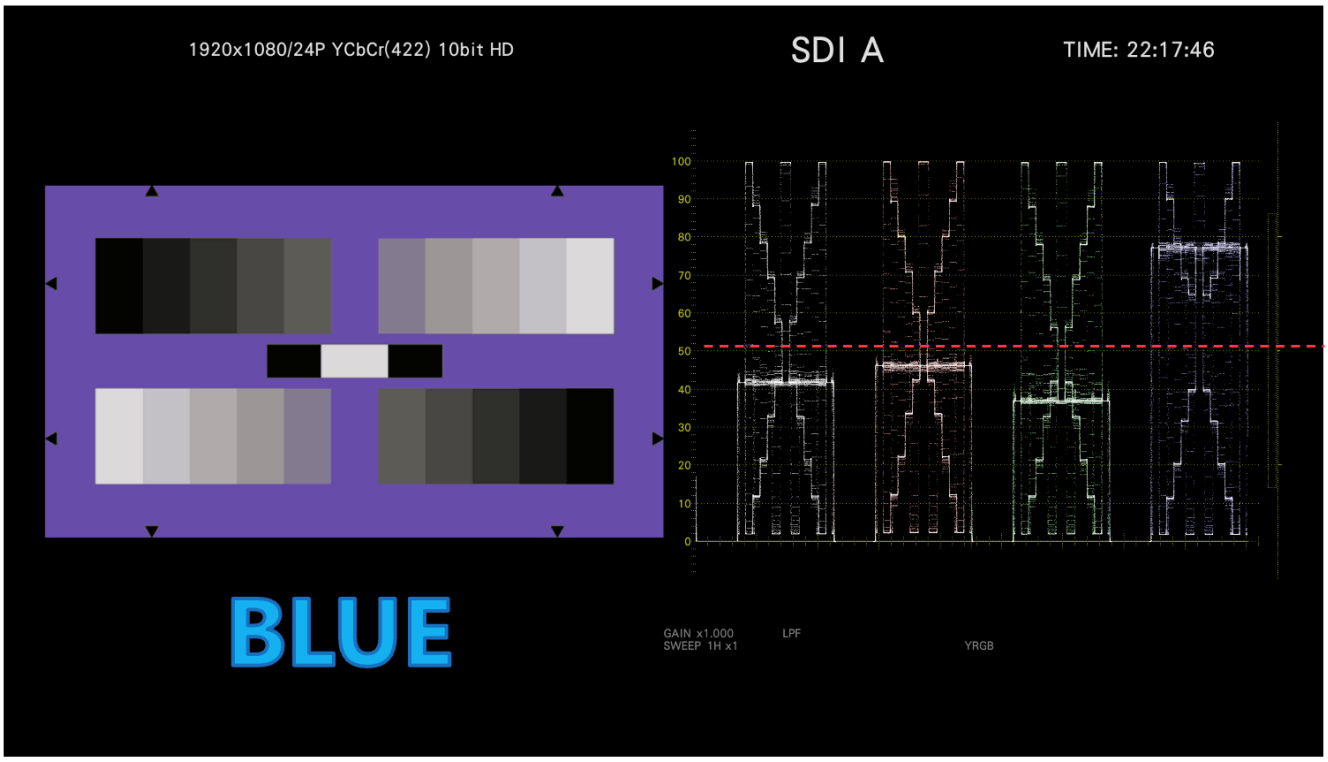
Greyscale Test Chart with Luminance set to 25%



Greyscale Test Chart with Red set to 70%



Greyscale Test Chart with Green set to 60%



Greyscale Test Chart with Blue set to 75%

Now, assuming you have correctly adjusted your luminance values, it's time to go back into the camera menu settings and turn on **Knee** and **White-Clip**.

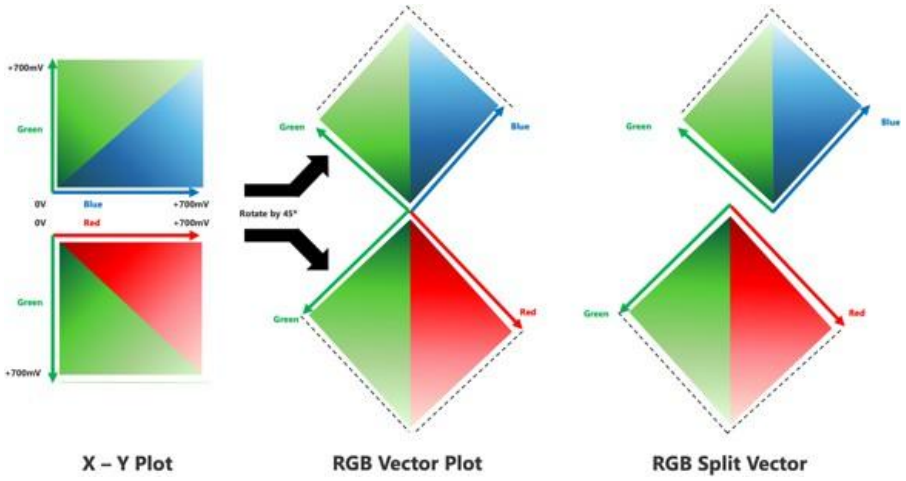
RGB Vector (Diamond Pattern) Display

The **RGB** Vector Diamond Pattern Display consolidates the white, black and mid-grey setup in a single analysis tool that simplifies camera setup operations. Allowing you to make quick and accurate adjusts of your camera setups.

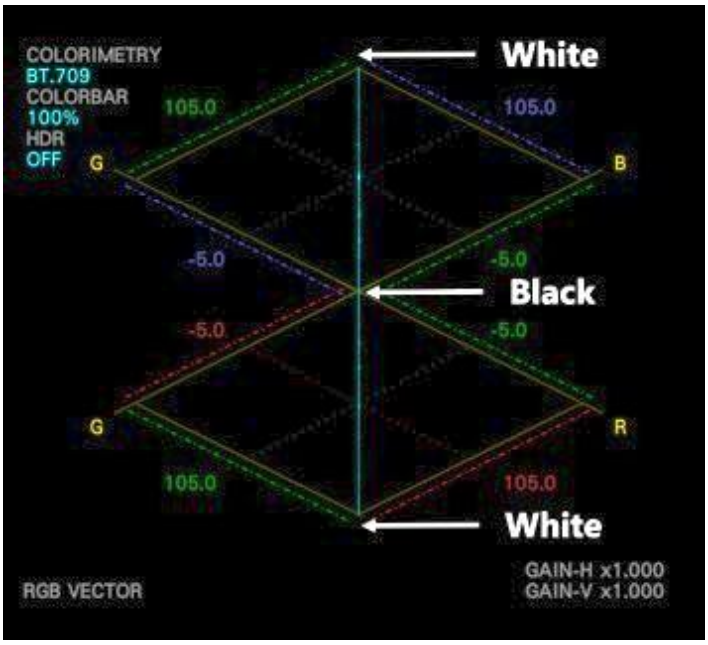
The **RGB** Vector Diamond Pattern Display is available as a software license upgrade (SER40) on all Leader's ZEN Series waveform monitors and rasterizers.

When working in the **RGB** domain the **RGB** Vector Display presents the **RGB** color cube or Diamond in a 2-D representation, with an X-Y plot of **Green** versus **Blue** in the upper diamond and **Green** versus **Red** in the lower diamond. To display the RGB Vector Display, select

VECT display ***F.1** VECT INTEN/CONFIG * **F.2** VECTOR MODE: VECTOR / **RGB VECTOR** / YCbCr VECTOR.

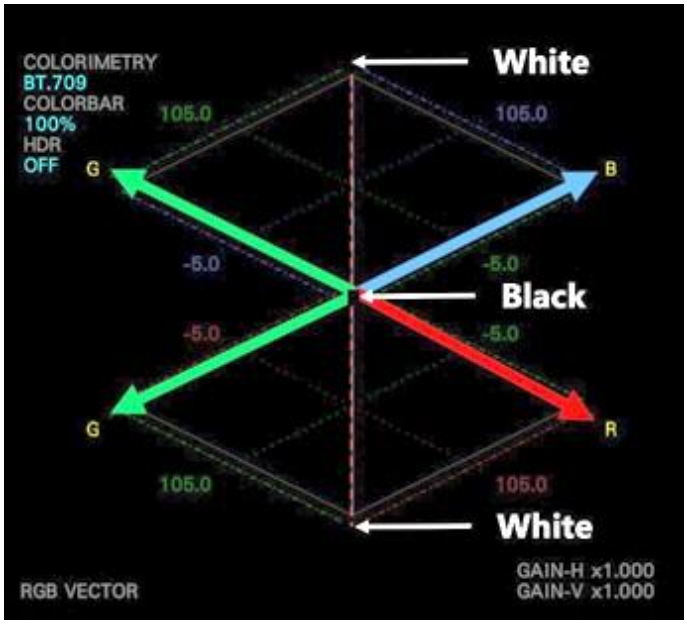


The luma component occurs in the vertical axis, Black in the center to white at the outer apex of the two diamonds.



RGB Vector Diamond Display – Luma Axis

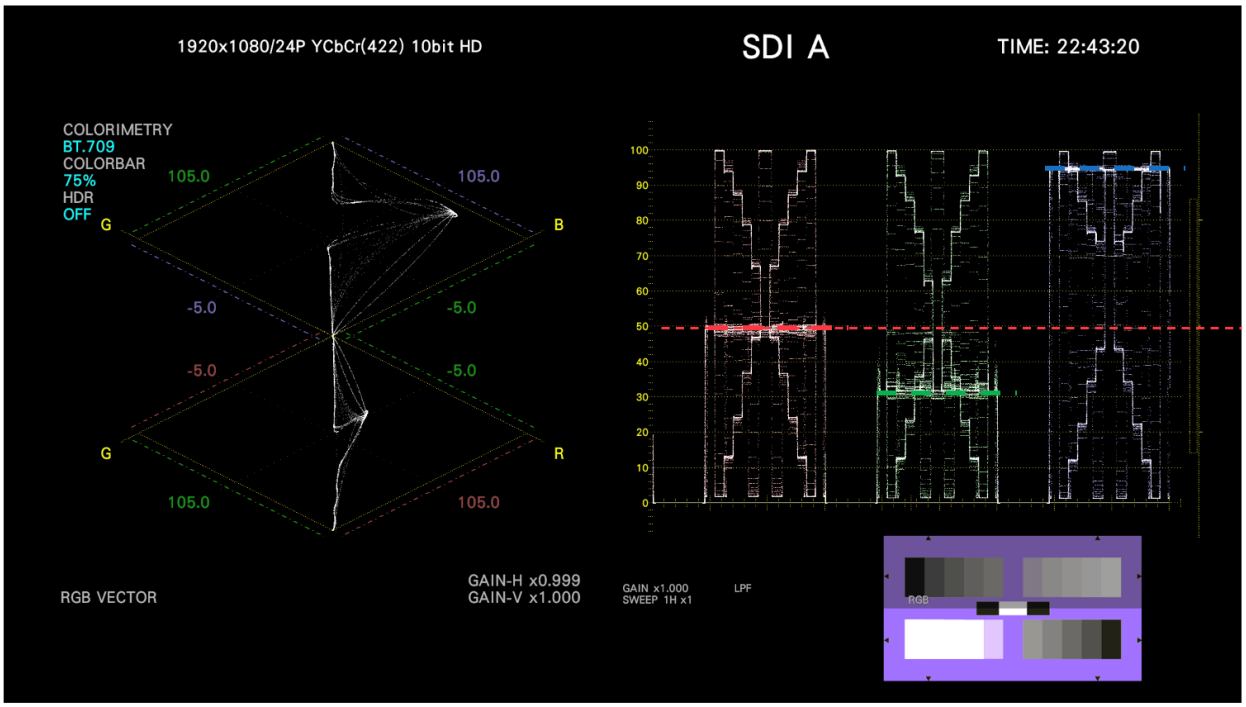
Chroma is shown in the horizontal axis.



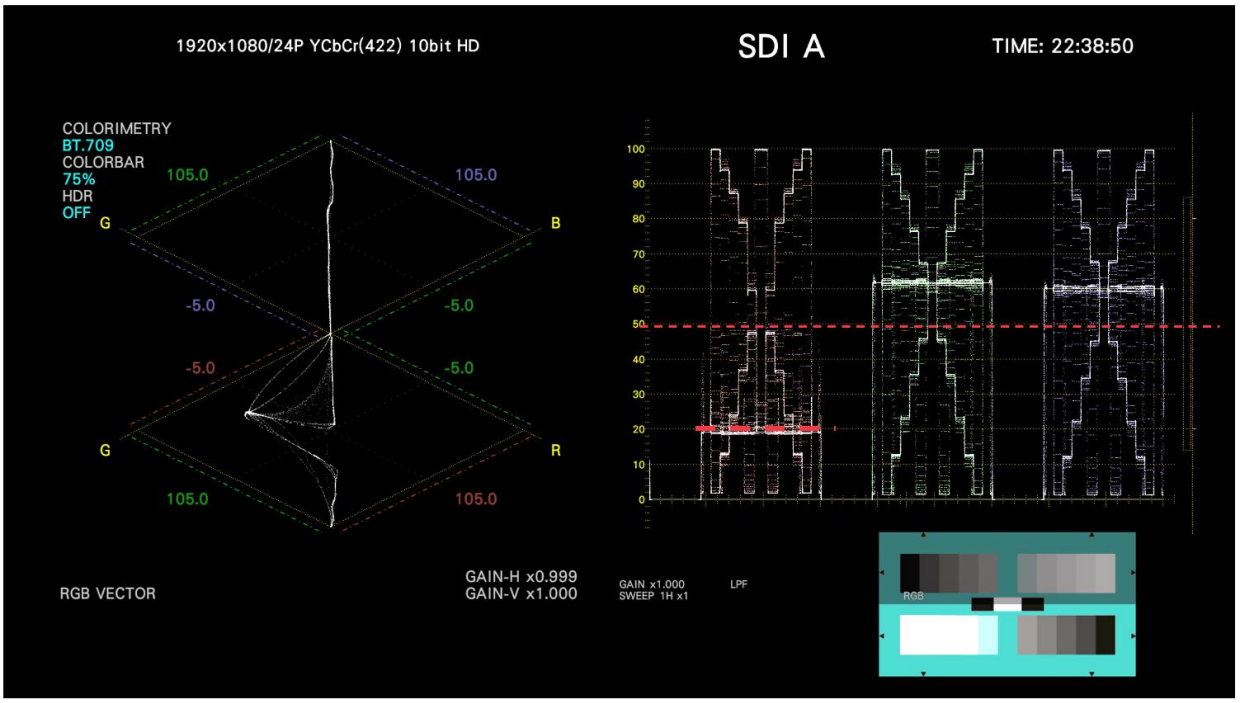
RGB Vector Diamond Display – Luma Axis

With the Leader RGB Vector Diamond Pattern Display, you can easily determine which RGB component needs to be adjusted.

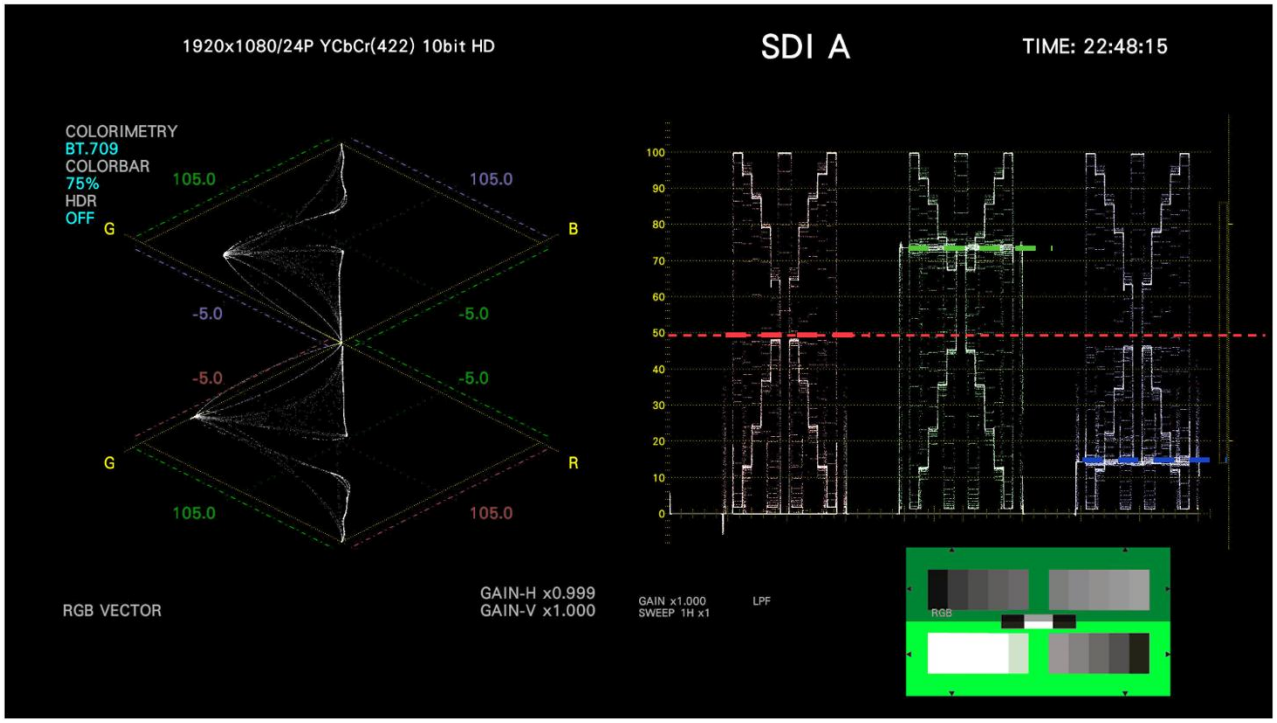
In the upper diamond, adjust the **Blue** camera channel to balance the camera and keep within limits.



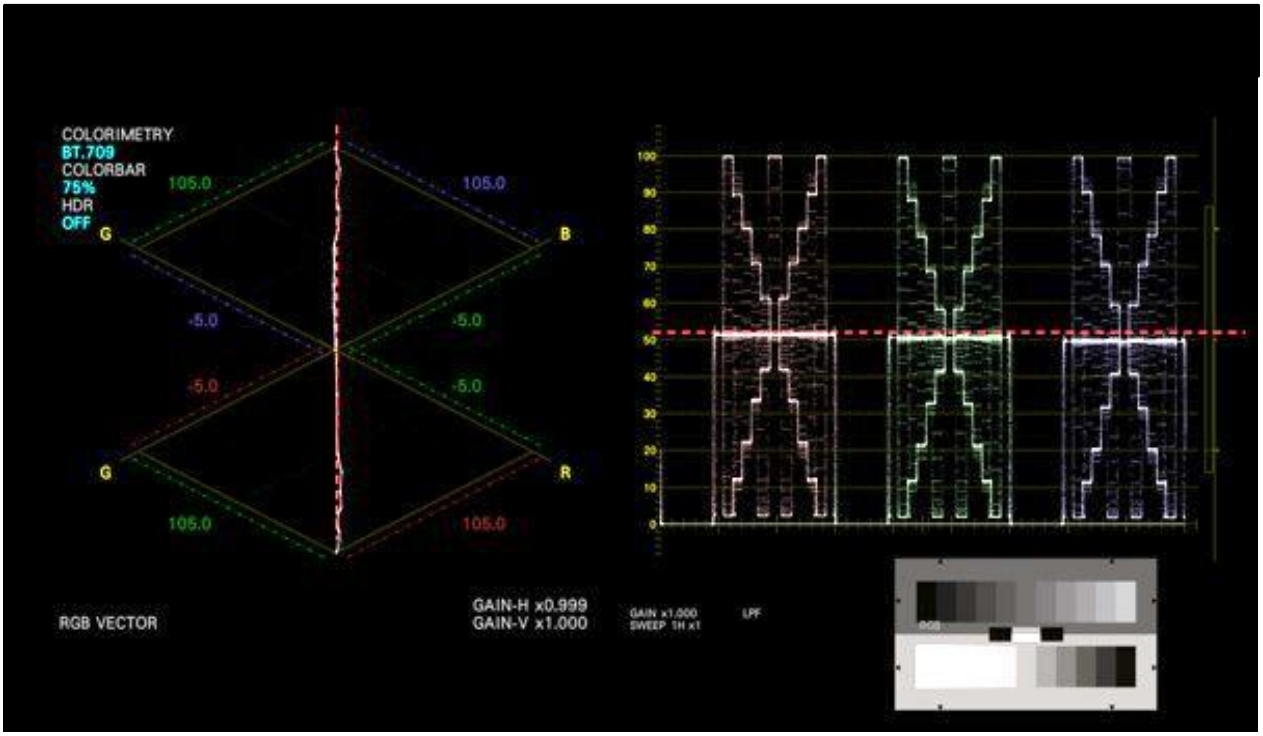
For errors in the lower diamond adjust the **Red** camera channel.



Adjusting the **Green** camera channel affects both the upper and lower diamond.

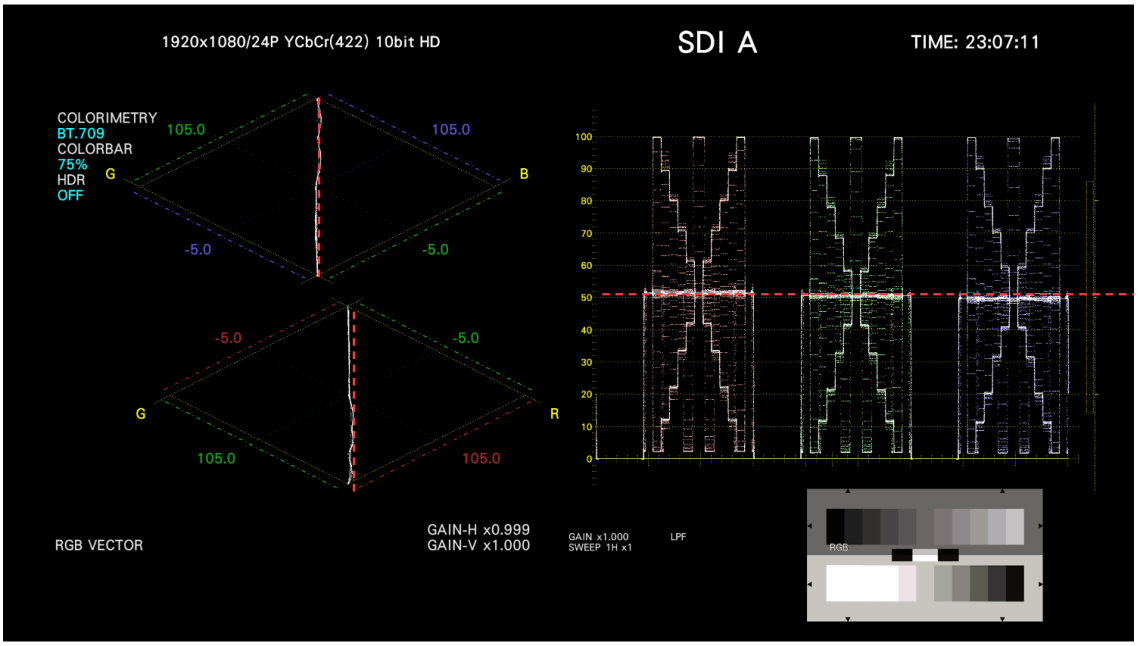


By maintaining a vertical look to the trace, you can ensure that your camera is balanced.

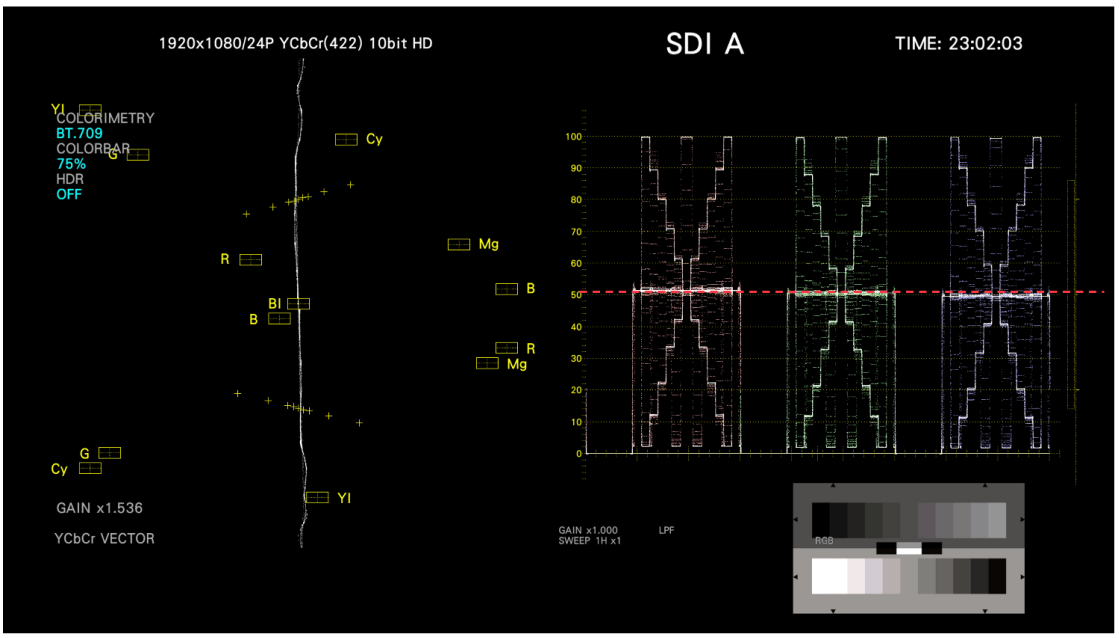


To get a better view of the **Black** transitions, simply split the two diamonds apart in the split diamond display.

VECT display * **F.1** VECT INTEN/CONFIG *__F.2__ VECTOR MODE: VECTOR / **RGB VECTOR** / YCbCr VECTOR * **F.2** RGB VECTOR SCALE * **F.3** ADJUST TARGET G-R / G-B * **F.4** G-B H or *__.5__ G-B V



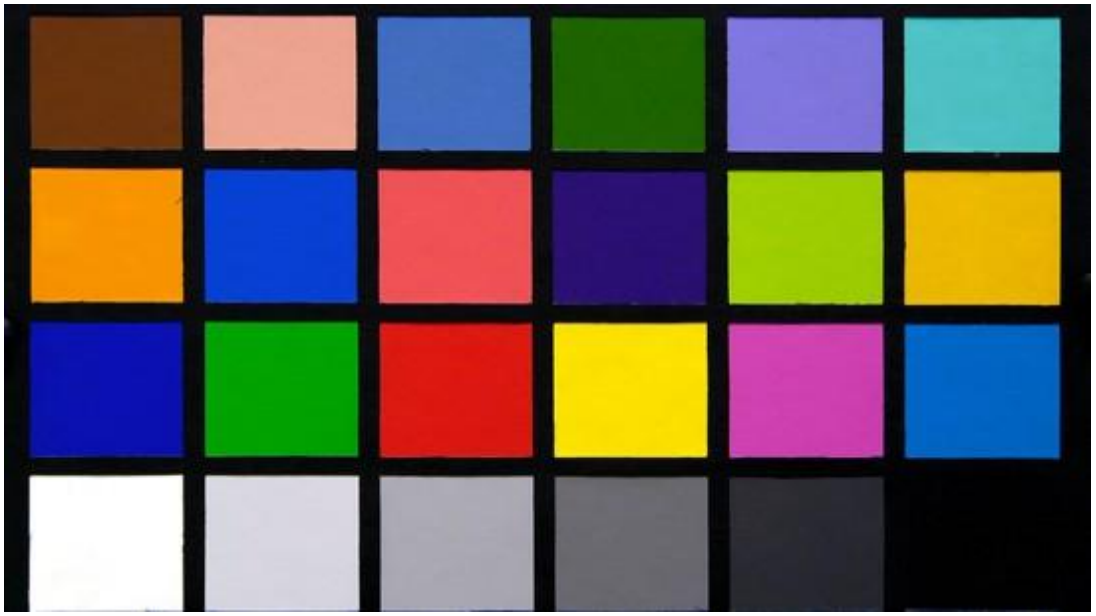
To enable you to take a closer look at the black level you can use the YCbCr Vector Lightening display and apply a GAIN to trace, so you can see that the trace is vertically aligned and pass over the central box.



This ensure that at a glance with the diamond & lightening pattern display, you can quickly identify any camera channel component in error.

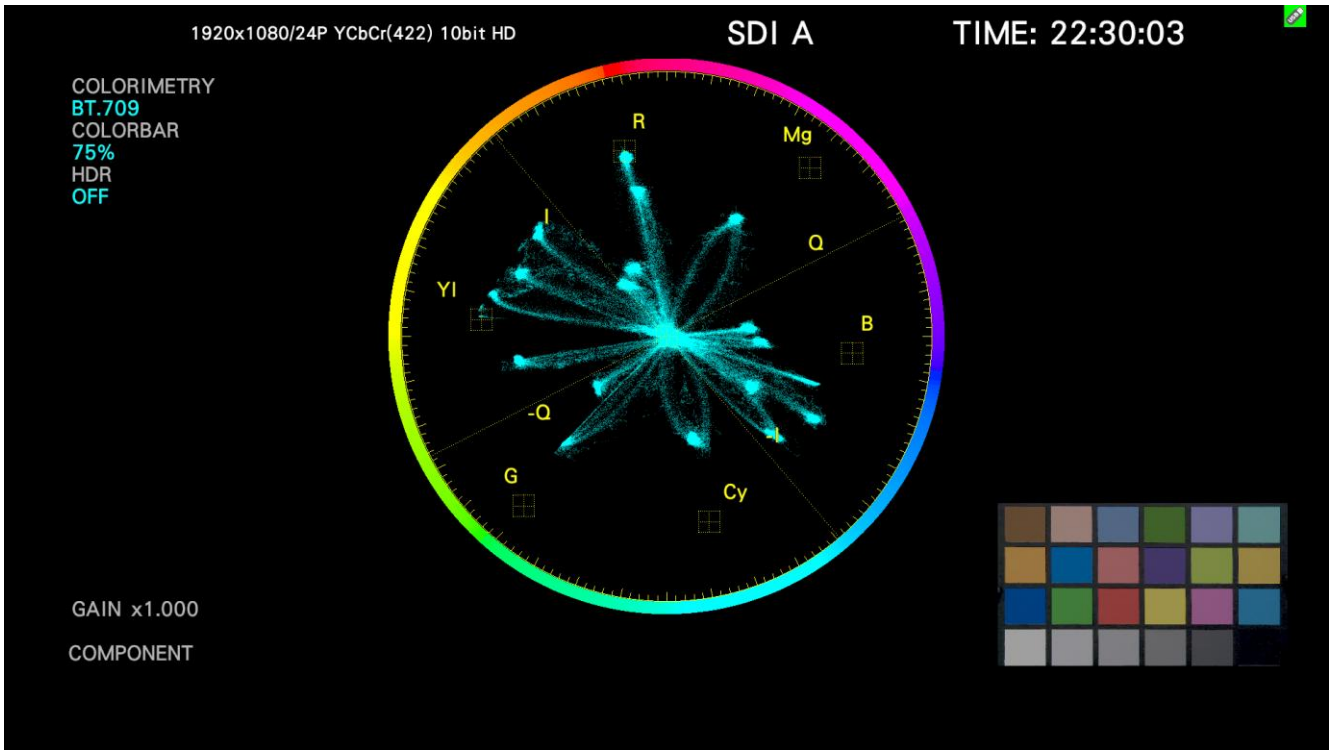
Checking the Color Values with a Vector Scope

To check the color values, we will be using the same procedure as with the Black, White and Middle-Grey cameras setup, but this time we will be using a different test chart. We will check the chrominance or color value with a vectorscope display.



MacBeth Color Chart

Select the **VECT** analysis display to display the Vectorscope display. If your camera color matrix is correctly set up, the vectorscope display will look like this.



Vectorscope Display of MacBeth Color Chart

Whether you go with your cameras default setting or you make adjustments totally depends on what look you want from your shot.

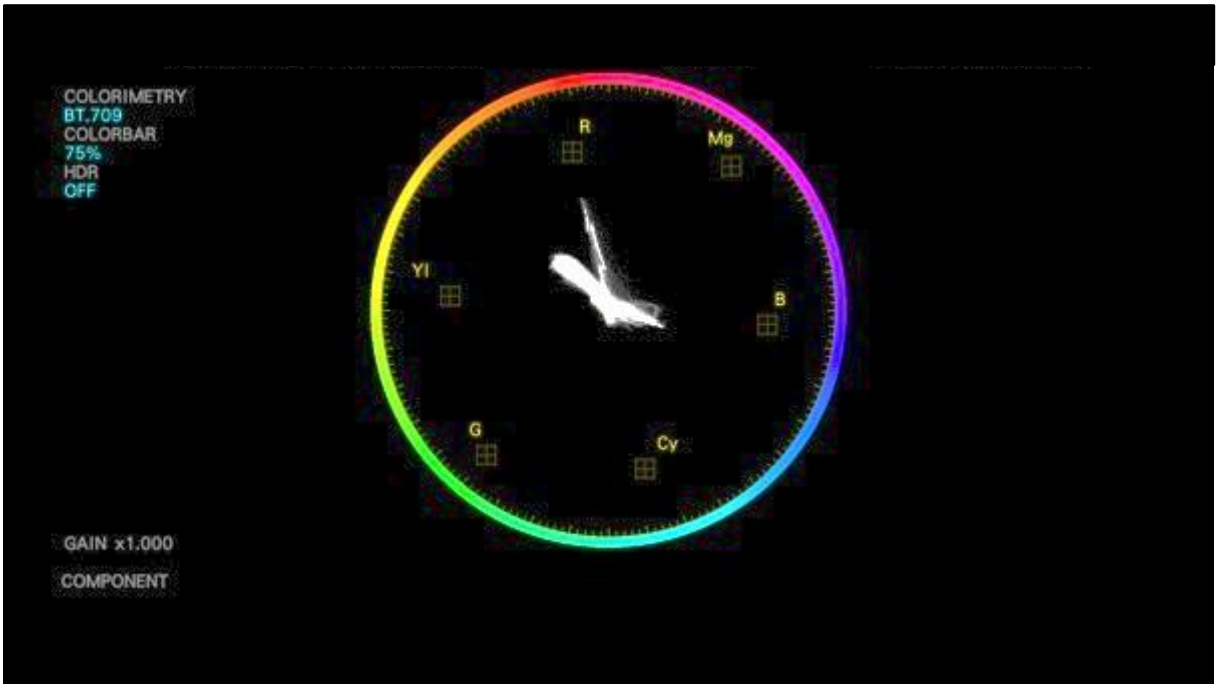
Commercials tend to use saturated color and as you have probably noticed many cinema and TV shows have their own preferred color theme. Whether you may want to alter the color scheme before shooting or if you would like to deal with that in postproduction in entirely up to you.

Regardless, using a vector scope is still a step that shouldn't be skipped if you want to avoid expensive delays further down the production workflow.

What is the purpose of the Vectorscope Display?

- The vectorscope complements the waveform display for the purpose of measuring and testing television signals, regardless of the format.

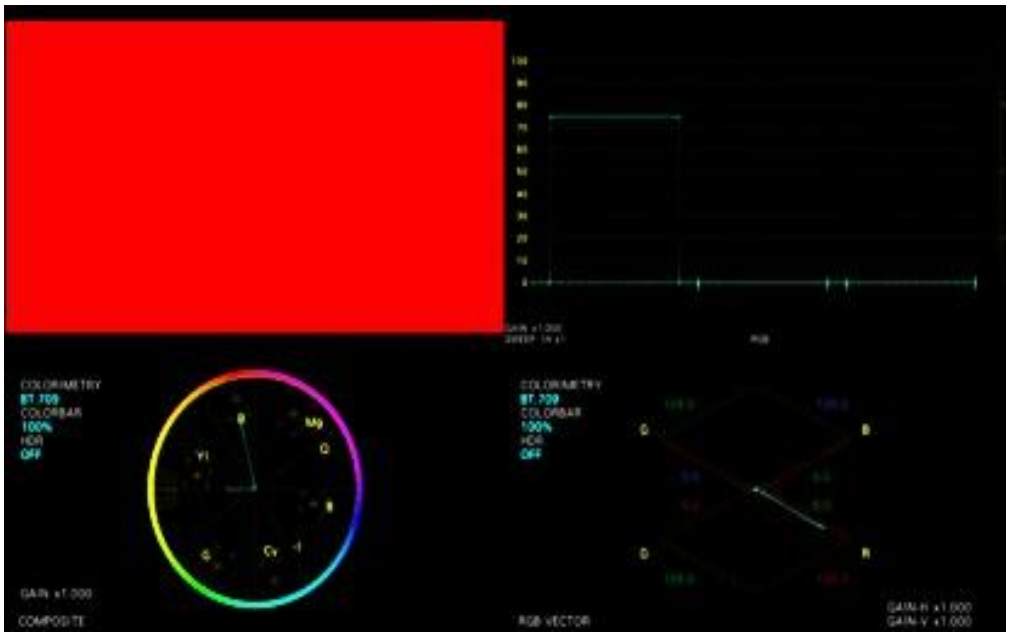
- While a waveform display allows the DIT to measure the overall characteristics of a video signal, a vectorscope is used to visualize chrominance, which is encoded into the video signal.



Vectorscope Display

The vector scope display only measures color levels, it does not measure saturation.

Saturation defines the intensity of the colors in the active picture. A 100% saturated color does not contain any white or any other color and in this case by adding white it reduces the saturation. In Video, adding white will desaturate the color, but white does not show up on a vectorscope display since only color shows up in the vector scope display.



100% Saturated, 100% red only, no other colors

In this case, the picture has been desaturated by adding white however, the vector scope trace still shows the same display as the saturated source, but you will notice that the desaturated picture looks Pink instead of bright Red.

75% Saturated (25% White added) Waveform, Vectorscope &

Diamond Pattern Display – Desaturation

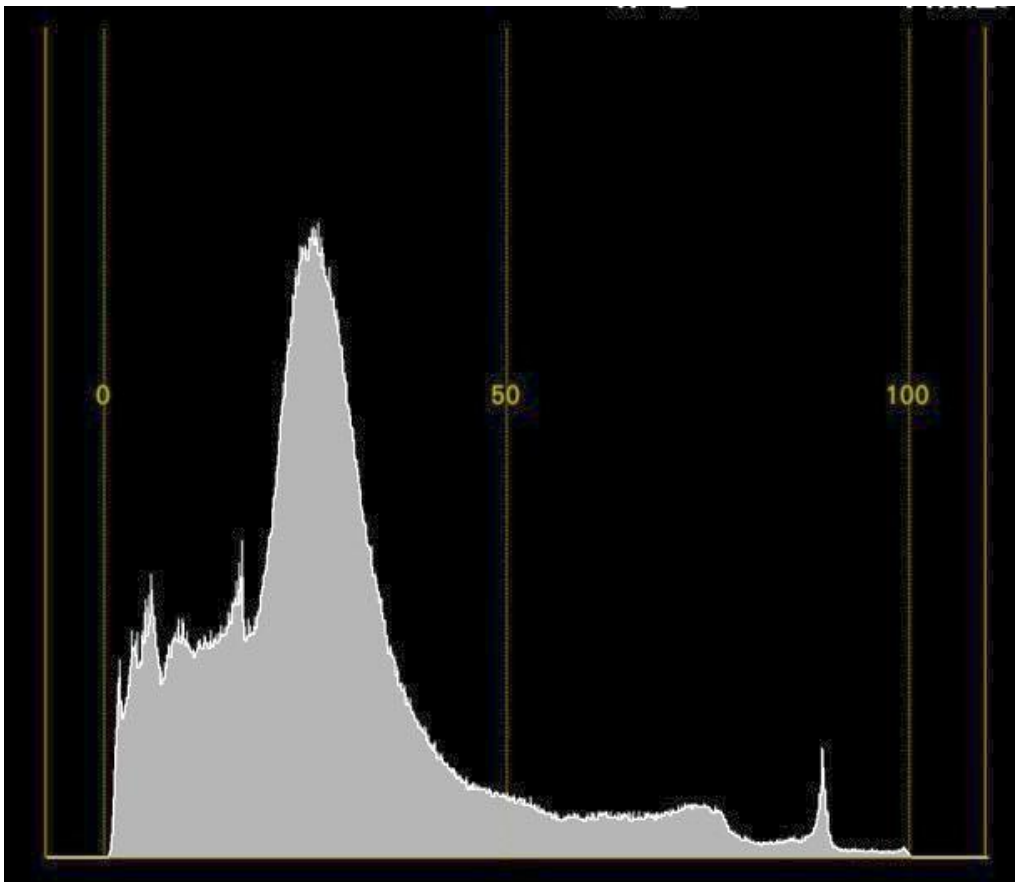
You will also notice the Diamond Pattern trace now indicates the addition of white.

What is the purpose of the Histogram Display?

The Histogram display, like the waveform display is used to provide the operator an indication of the exposure of the image and comes as standard on all Leader ZEN Series products.

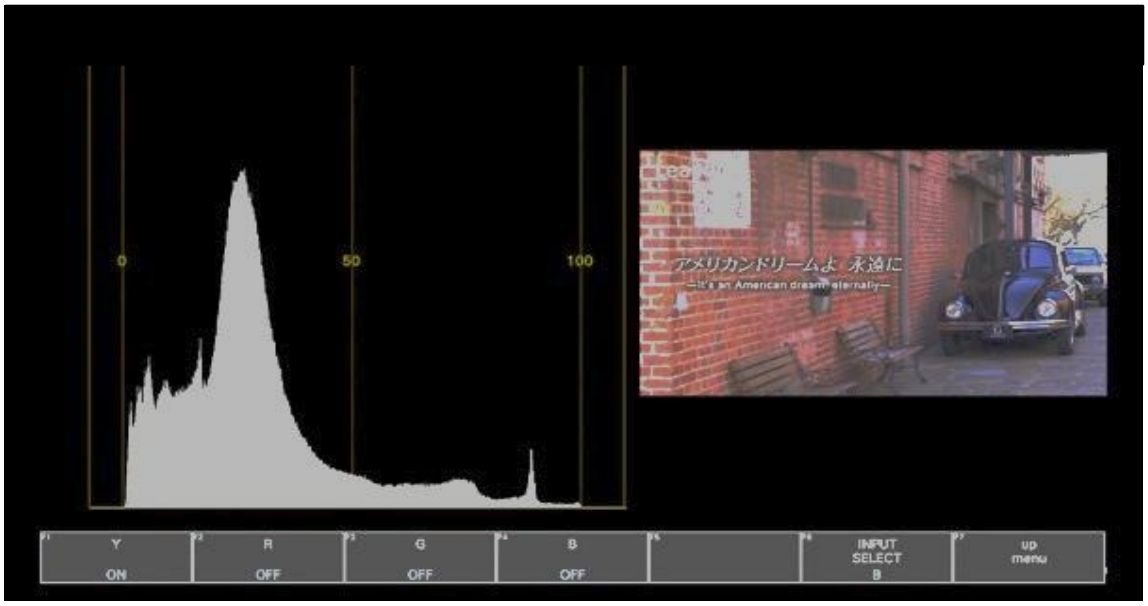
How to read a Histogram Display

A histogram is a graphical representation of the pixels in your image. The left side of the graph represents the blacks or shadows, the right side represents the highlights or bright areas, and the middle section represents the mid-tones (middle or 18% gray).

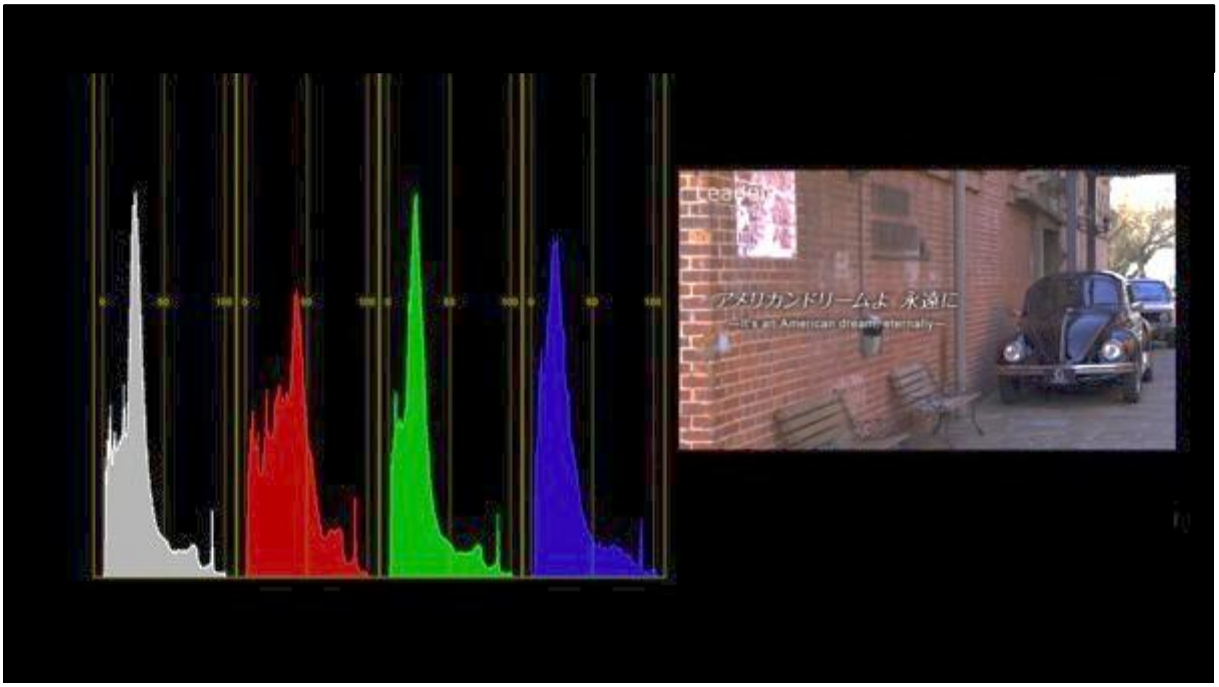


Histogram Display

The Histogram display can be configured to show the luminance component.

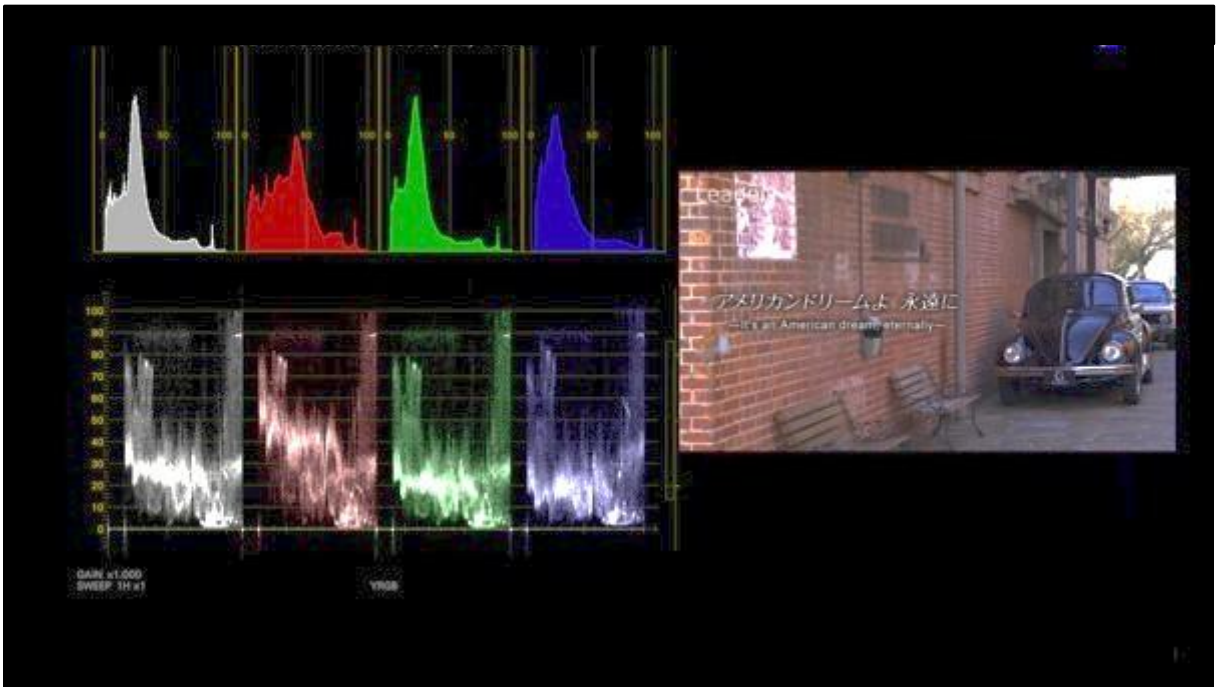


Histogram Display – Luminance Channel (Y)



Histogram Display – Align-H

As the Histogram display is used for correctly setting exposure, it is useful to be able to display this with both the picture and the waveform display and with the Leader ZEN Series SER26 100% Customizable Layout software license option the operator can display all three measurement tools simultaneously and position and size them according to their operational requirements.



Histogram / Waveform / Picture Display

Why you need a waveform monitor during production

Waveform monitors are not only a pre-production tool, but they are also equally useful during production.

If you are familiar with a light meter, we encourage you to use one. Most DoP's rely on light meters for film and HETV productions.

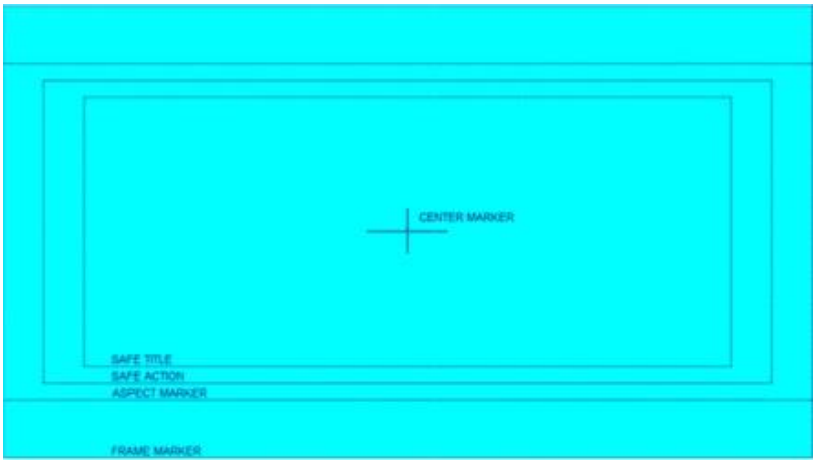
A light meter measures the light coming in through the lens of the camera.

While the waveform monitor actually measures exactly what is to be processed and recorded inside the camera.

This means that if one or more of your camera settings are set incorrectly, this means that your light meter would not be able to detect this, and this could cause problems later in postproduction. By using a waveform monitor you can immediately and accurately display what results will look like.

Aspect Marker Display

Waveform monitors feature Aspect Marker displays, that are superimposed on the picture display. The Display markers assist the DoP in framing the shot, thus ensuring that they keep everything they shot within that area.



Horizontal marker display

All Leader ZEN Series products come preconfigured with the following Aspect Ratios.

OFF: The aspect marker is not displayed.

17:9 A 17:9 aspect marker is displayed. This option cannot be selected when the input signal is a 17:9 frame signal or an SD signal.

16:9: A 16:9 aspect marker is displayed. This option cannot be selected when the input signal is a 16:9 frame signal.

14:9: A 14:9 aspect marker is displayed.

13:9: A 13:9 aspect marker is displayed.

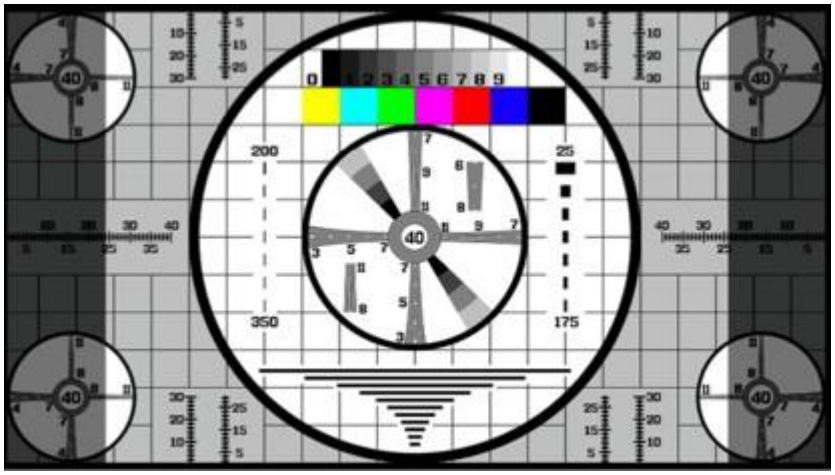
4:3: A 4:3 aspect marker is displayed. This option cannot be selected when the input signal is SD.

2.39:1: A 2.39:1 aspect marker is displayed. This option cannot be selected when the input signal is SD.

AFD: The aspect marker included in the AFD (Active Format Description) packets is displayed. Also, abbreviations for SMPTE ST 2016-1-2007 standard AFD codes are displayed in the upper left of the screen. This option can be selected when the input signal is SD or HD.

Aspect Shadow

All Leader ZEN Series also allow the operator to adjust the Aspect Shadow intensity, so objects that are just out of shot are visible, irrespective of the production environment.



Setting the aspect shadow

Safe Action Markers

All Leader ZEN Series feature configurable safety action marker settings, thus ensuring that the most important parts of the picture are seen by the majority of viewers.

ARIB: An ARIB TR-B4 safe action marker is displayed. This setting cannot be selected when the input signal is 4K.

SMPTE: A SMPTE RP-218 safe action marker is displayed. This setting cannot be selected when the input signal is 4K.

USER1: A marker that has been set with F.1 USER1 WIDTH% and F.2 USER1 HEIGHT% for F.3 USER1/2 is displayed.

OFF: A safe action marker is not displayed.

Safe Title Markers

All Leader ZEN Series feature configurable safe title marker settings, thus ensuring that any graphics overlaid on the picture are seen by the majority of the viewers.

ARIB: An ARIB TR-B4 safe action marker is displayed. This setting cannot be selected when the input signal is 4K.

SMPTE: A SMPTE RP-218 safe action marker is displayed. This setting cannot be selected when the input signal is 4K.

USER1: A marker that has been set with F.1 USER1 WIDTH% and F.2 USER1 HEIGHT% for F.3 USER1/2 is displayed.

OFF: A safe action marker is not displayed.

CINELITE and CINEZONE

CINELITE and CINEZONE are two extremely useful features, that come as standard on all Leader ZEN Series products. CINELITE and CINEZONE allow you to monitor luminance with pin-point accuracy.

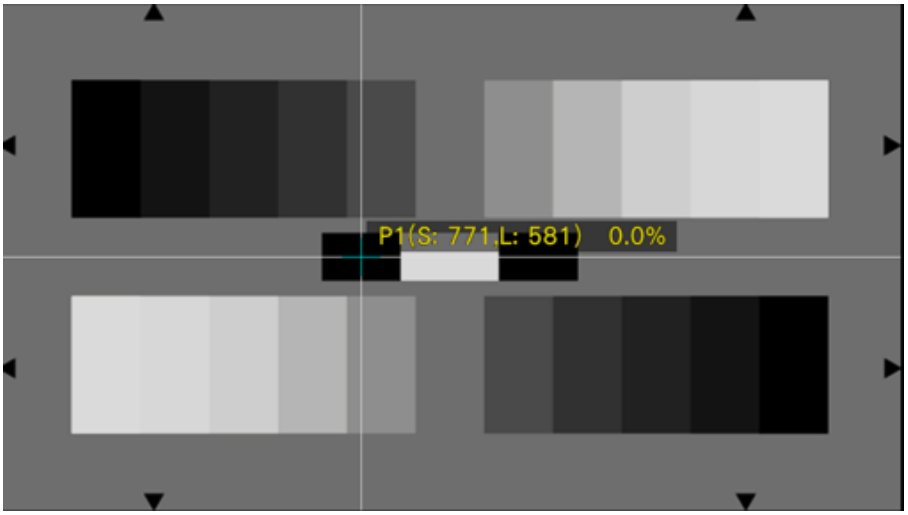
When monitoring luminance, using a waveform monitor, either in your setup or postproduction, it's hard to determine exactly which area is being measured on the monitor.

Using CINELITE, you are able to know these values instantly.

CINELITE

CINELITE is a built-in 'light meter' tool that provides on-picture measurement of video levels in both luminance %, RGB%, RGB255, CV (code value), CV (DEC), HDR and f-stop readings which bridges the gap between film and digital camera production.

For the first time, DITs can now review and evaluate their setup after the camera has processed the image. Point a cursor to any position on the picture to get instant measurement in luminance %, RGB%, RGB255, CV, CV (DEC), HDR with SER26 HDR analysis software license and f-stops and review the material that is actually being recorded. Final adjustments of lighting conditions, filtering and iris adjustments can be made using the familiar f-stop-based evaluation techniques.

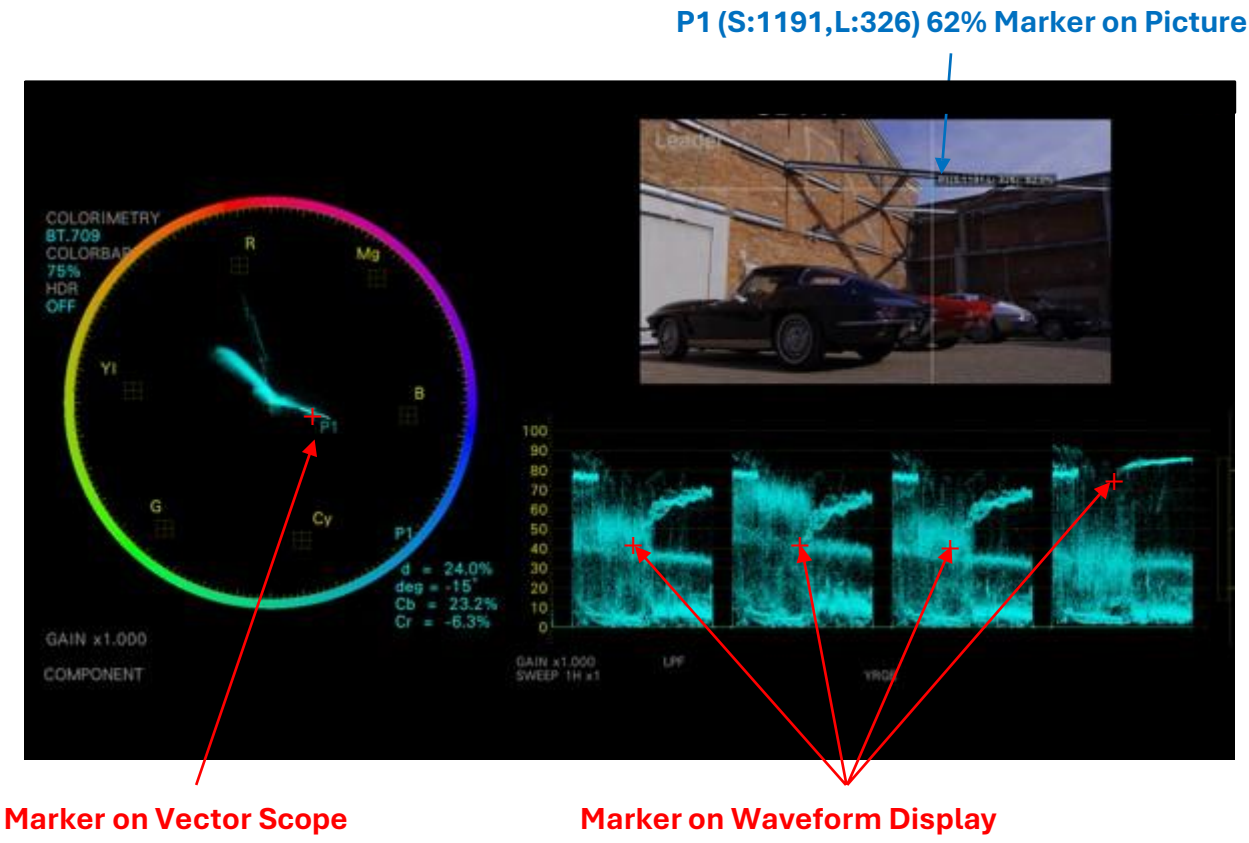


CINELITE Display

The resulting measurement is digitally accurate and represents the material as it is actually recorded. This ensures scientifically accurate communication with the post-production and color correction process while enhancing the understanding of film and video experts alike.

CINELITE Advanced

To assist DIT's and DoP's quickly identify and adjust areas of the image that are of concern, CINELITE Advance features an enhanced displays tool that displays the CINELITE markers on the waveform display, vector scope display and CIE Color chart display



CINELITE Advance Picture & Waveform Display

With more and more productions now acquiring in 4K/UHDTV resolutions as well as using log-based gamma curves for HDR production, CINELITE is the ideal tool to use on-set rather than having to use full-size broadcast monitors with multiple lookup tables to try and reassure production staff that the cameras are correctly exposed.

CINELITE f-Stop Measurement

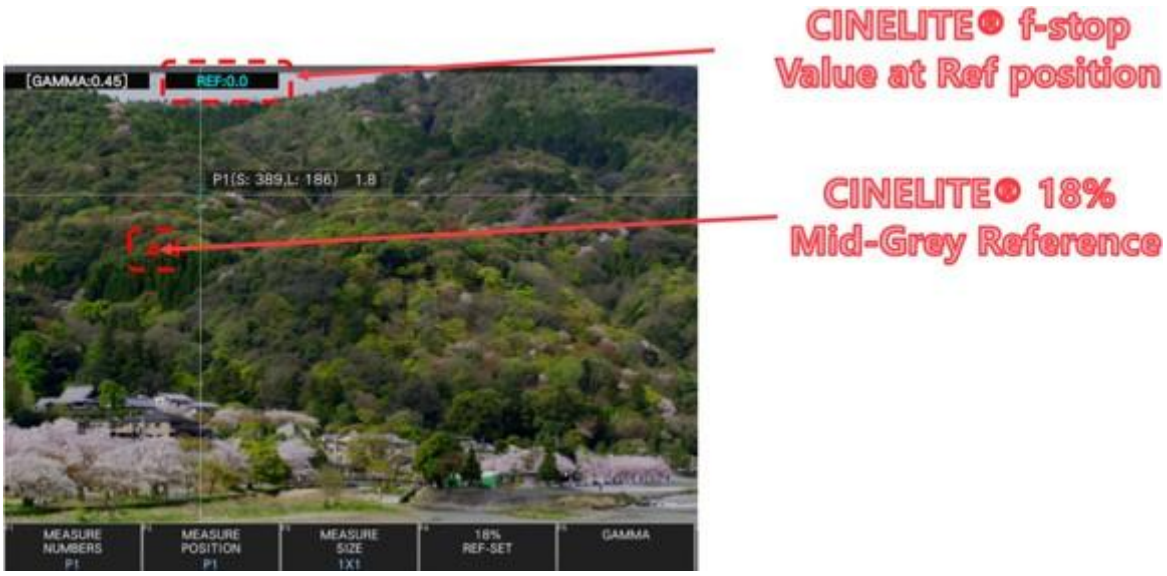
CINELITE f-stop measurement allows DoPs and cinematographers to evaluate their HETV production using the same measurement techniques that have produced excellence with film over decades. Essentially, the CINELITE f-Stop display option allows the DIT and the DoP to evaluate their lighting and exposure in real time and helps create a set evaluation and exposure determination workflow environment similar to working with film.

CINELITE f-stop Advance Picture & Waveform Display – 18% Mid-Grey Reference

As part of the CINELITE f-Stop measurement adjustment, you can set the Gamma Correction Value to match the camera settings.

CINELITE f-stop – Gamma Correction Value

CINELITE f-Stop measurement also displays the f-Stop value at the reference position. The value immediately after you have pressed **F.4 18% REF-SET** is zero, but it will change when the picture changes



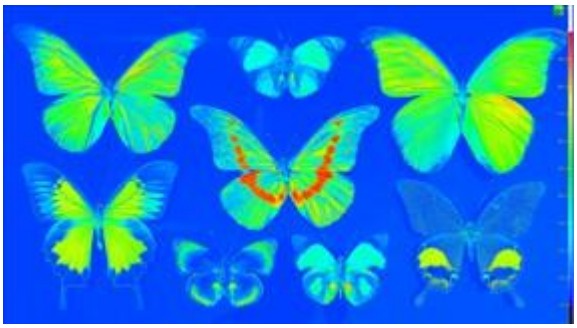
CINELITE and CINELITE Advanced come as standard on all Leader waveform monitors and rasterizers, these allow DITs to monitor and control with a high degree of accuracy the relative exposure and overall luminance levels whilst ensuring that the resulting content conforms fully to productions delivery specifications.

CINEZONE

The other feature is called CINEZONE.

CINEZONE shows the luminance value with a ‘real-time’ false color display of the output of the camera.

Camera output



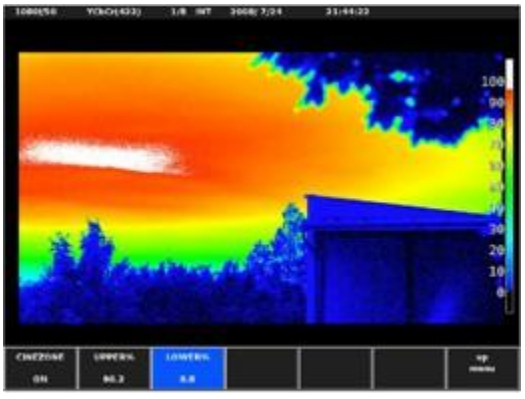
Leader CINEZONE display

Providing instant view of your lighting conditions and easy determination of exposure zones.

CINEZONE® overlays false colors on the image. It colors the strong and weak areas of brightness on the picture display so you can judge the conditions of luminance (brightness) of the entire screen. Blue indicates near-zero values (shadows), red indicates values at 100% (highlights) and white indicates areas of the screen that are over-exposed. This helps confirm your camera is reproducing what you expect.

For the first time, DITs can now review and evaluate set after the camera has processed the image. CINEZONE® overlays real-time false color on the image so you can quickly and easily identify areas of the image that are under or over exposed.

CINEZONE - Under exposed image / Low light images



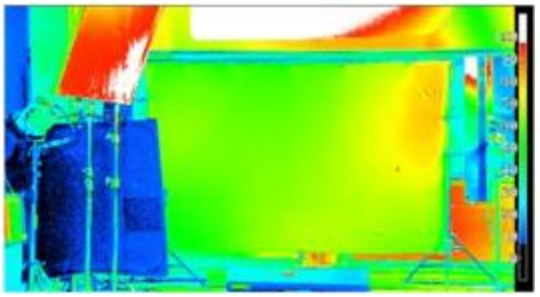
CINEZONE® is also extremely useful, when working in low light environments. Typically, you would have to increase the gain on the camera to ensure that the image is correctly focused. If you are working on a multi-camera production, you need to ensure all cameras are reset to the same gain level before recording starts or you will have discrepancies between your recordings. With CINEZONE you do not need to adjust the gain of the camera; you simply adjust thresholds on the Leader scope to allow you to accurately review and set up the camera.

CINEZONE - Chroma key / Greenscreen setup

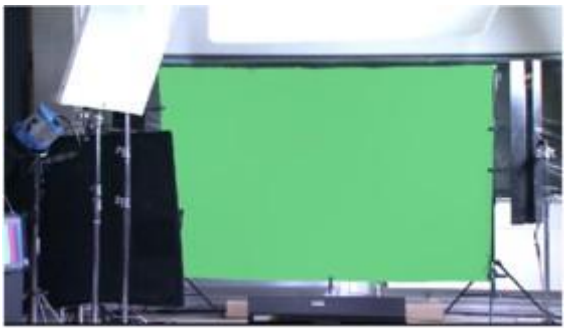
With more and more productions using ‘Virtual Studios’ and ‘Video Arrays’, correct lighting for the background & green screen is essential or the image will appear uneven and distorted. Since uneven brightness is difficult to judge using the naked eye, CINEZONE allows easy and precise adjustment of the lighting to ensure even images.

Picture display (before adjustment)

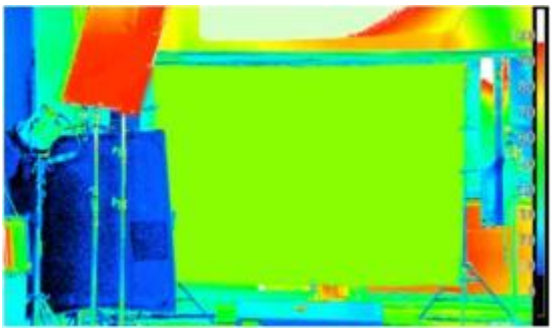
CINEZONE® display (before adjustment)



Picture display (after adjustment)



CINEZONE® display (after adjustment)



CINEZONE Greenscreen Production

Onset HDR-SDR Color Pipeline

With camera manufacturers increasingly implementing their own **False Color exposure tools** to assist productions, **ARRI**, **RED**, and **Sony** have each developed proprietary on-board **Real-time False Color** exposure displays.

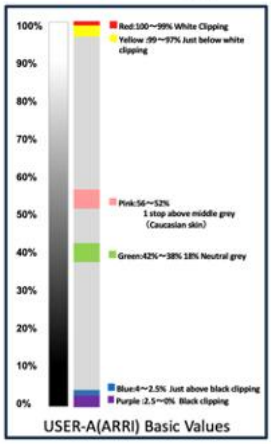
To support this evolving workflow, **Leader** has incorporated these same **ARRI, RED and Sony Real-time False Color exposure modes** into the **Leader ZEN Series waveform monitors**.

With the SER23 HDR Analysis software licence, the Leader ZEN Series supports ARRI Log-C3, Log-C4 ALEXA 35 & LOG C-4 ALEXA 265, RED and Sony false color display.

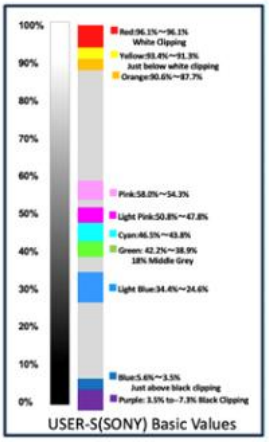
This enhancement allows the identical false color exposure views normally generated within the camera to be reproduced directly on the waveform monitor at the **DIT cart**. As a result, DITs and video engineers no longer need to rely solely on the camera's onboard display when evaluating exposure.

By enabling independent monitoring of these camera-specific False Color profiles, the ZEN Series provides production teams with an additional layer of confidence. Exposure levels can be verified in real time at the DIT position, helping to identify and correct potential issues before recording begins. The result is a more robust on-set workflow, where exposure decisions can be validated collaboratively across camera, DIT, and video engineering teams—reducing risk and ensuring image consistency throughout the production pipeline.

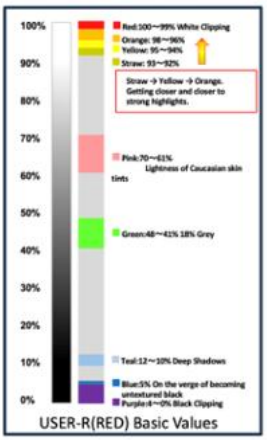
ARRI



SONY



RED



ARRI Log-C3 False Color Display

The Leader ZEN Series waveform monitors also supports the ability with the SER23 HDR Analysis software licence to import and display analysis using imported 3D LUTs.

The 3D-LUT Cube files can be loaded and are used to display SDR and HDR picture, waveform in simultaneous HDR/SDR productions.

- Picture display, waveform display, vectorscope, CIE chart and histogram are supported.
- A maximum of 10 Cube files can be registered.
- The 3D-LUT is effective in HDR/SDR Simultaneous production
- The interpolation method uses 33-point tetrahedral interpolation.
- SDI output after 3D-LUT conversion (LV5300(A)/LV5350/LV7300 not supported)
- Input/output conversion Gamma SDR/HDR (HLG, PQ, S-LOG3, LOG-C, C-LOG), Colorimetry BT2020/BT709/DCI compatible
- Range Full/Narrow support.
- Cube file information, header information display

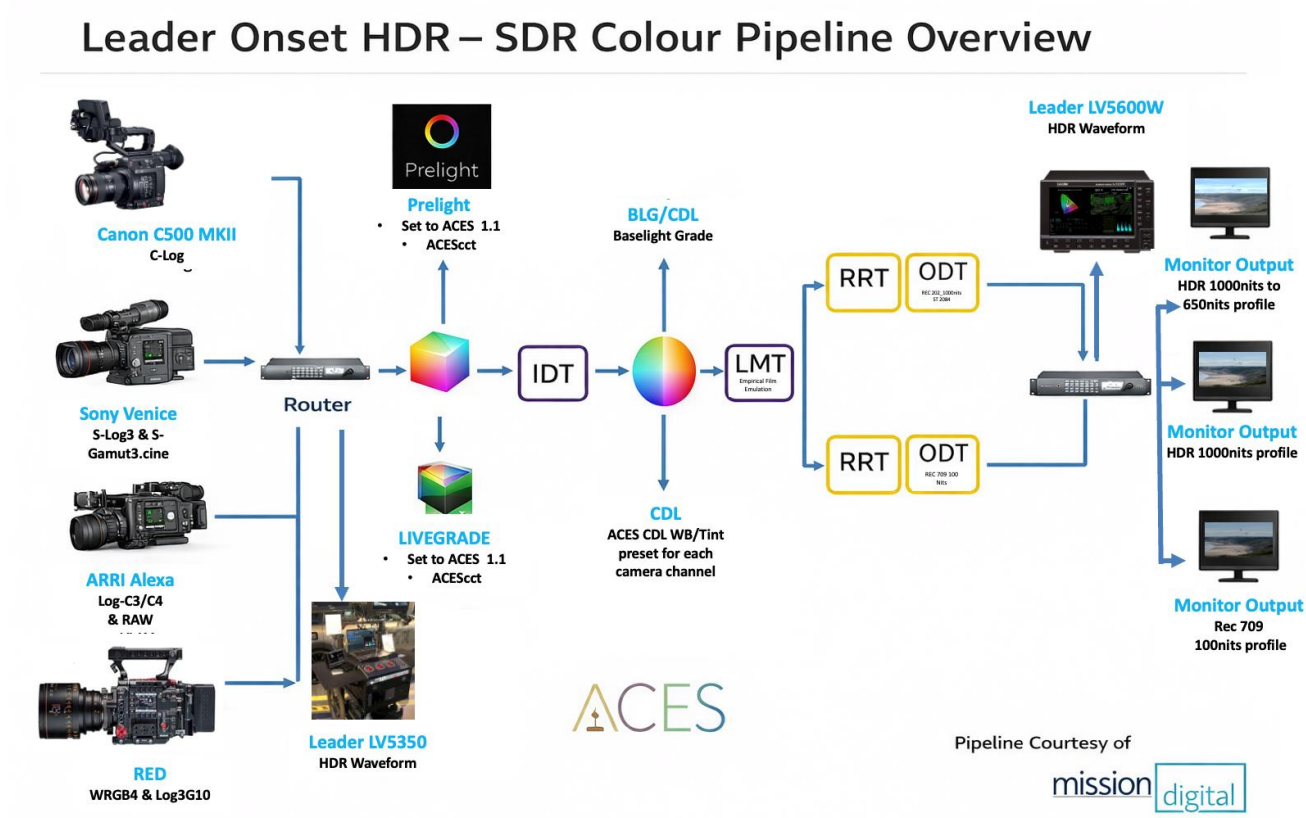
The ability to import and analysis using 3D LUTs on the Leader waveform monitor can prove invaluable, when it comes to location production.

- As LUT-boxes on DIT carts require an external power source, this makes them difficult to deploy on location production where AC power sources are limited.

- With Leaders' new 3D LUT import capability, the LV5350 waveform monitor can not only provide all the essential analysis tools you need to ensure the camera set up and recording is correct, but it can also store and apply up to (10) ten 3D LUTs to the picture, waveform, vectroscope, CIE Colour chart and Histogram analysis.

- The Leader LV5350 also supports a 3D LUT output, that allows personal on-set to monitor the images.

The ACES Onset HDR-SDR Color Pipeline below, developed by Mission utilizes the Leader LV5350 waveform monitor on the DIT's cart.



The Leader LV5350 waveform monitor with the High Dynamic Range software license (SER23) allows on-set monitoring of Canon (C-Log), Sony (Slog3), ARRI (LogC3/LogC4) & RED Log3G10 in their native log formats. Ensuring the correct exposure and setup, thus guaranteeing the rushes do not require significant technical reworking in postproduction.

FilmLight's Prelight can control a LUT box to upload looks onset and includes full ACES support and does not require a camera with ACESproxy output. If you are carrying out the Digital Intermediate (DI) in BaseLight, you can use the full BaseLight toolset to create looks and save them as BLGs (BaseLight Grade File), with metadata linking them to the shots they were used on), but you can also use it in CDL (Color Decision List) mode to save looks for other grading systems. LIVEGRADE provides look management on set that integrates with various camera workflows.

Look Modification Transform (LMT) is a specific change in the look that is applied systemically in combination with the Reference Rendering transform (RRT).

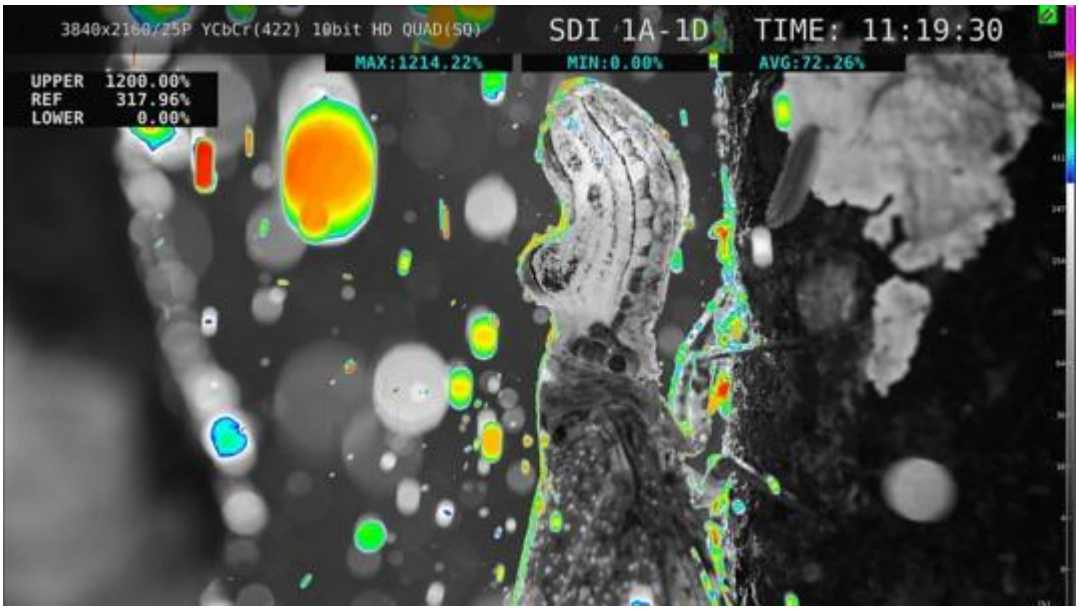
The Reference Rendering Transform (RRT) converts the scene-referred colorimetry to display-referred and resembles traditional film image rendering with an S-shaped curve. It has a large gamut and dynamic range available to allow for rendering to any output device (even ones not yet in existence)

Output Device Transform (ODT) provides a guideline for rendering the large gamut and wide dynamic range of the RRT to a physically realized output device with limited gamut and dynamic range.

The Leader LV5600 waveform monitor with the same toolset as the Leader LV5350 that was used Onset will be used by the colorist to deliver the finished master in the various HDR and SDR deliverables the end client has specified.

CINEZONE High Dynamic Range (HDR)

CINEZONE HDR offer enhanced 'real-time' false color display of HDR images on the Leader scopes.



CINEZONE HDR display

For the first time, DoPs, camera assistants and DITs can view HDR images on set without having to deploy expensive reference monitor displays on set.

Building on the CINEZONE exposure zone false colors display, CINEZONE HDR supports ITU.BT2100 Hybrid Log Gamma (HLG), PQ (SMPTE ST 2084), Arri LOG-C, Canon C-LOG and Sony Slog-3 formats.

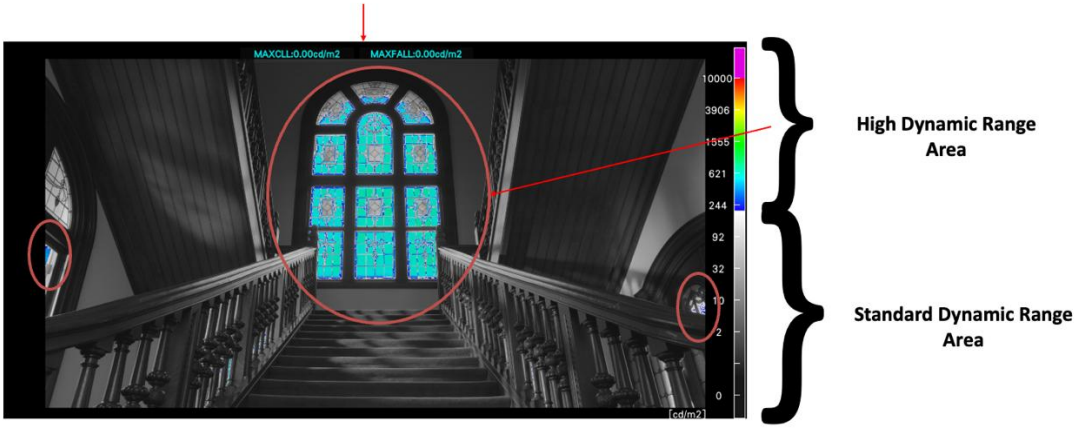
- **ITU-R BT2100 Hybrid Log Gamma (HLG)** – Jointly developed by the BBC and NHK, HLG is an open royalty-free approach which specifies the system parameters essential for extended image dynamic range television (EIDRTV) including system colorimetry, signal format and digital representation. The LV5350 comes preconfigured with HLG presets of 50% and 75% reference. This reference can be adjusted to satisfy production requirements.
- **ITU-R BT2100 PQ : Perceptual Quantization** – Developed by Dolby PQ (Perceptual Quantizer) is a license based proprietary standard. It uses SMPTE 2084 EOTF and a peak brightness that can go as high as 10,000 nits. This reference can be adjusted to satisfy production requirements.
- **Log-C** is used by Arri when encoding images on their cameras. The Log-C curve is a set of curves for different exposure indices. The LV5350 supports Exposure Indices (EI) of 200, 400, 800 and 1,600.
- **C-Log** is used by Canon when encoding images on its cameras.
- **Slog3** – Developed by Sony, this is being introduced across the company's range of broadcast and professional cameras and monitors

When HDR Mode is set to HLG or PQ, select the reference level for the program production. When HDR Mode is set to S-Log3, C-Log3 or Log-C, it is set to default value and cannot be selected.

When the HDR mode is set to PayloadID UnSpec:S-Log3, PayloadID UnSpec:C-Log, or PayloadID UnSpec:Log-C, select the level by combining the HLG and PQ levels. The HLG or PQ reference level selected with Ref. Level is applied according to the payload ID information. When the payload ID information is Unspecified, the S-Log3, C-Log, or Log-C reference level is applied. When the payload ID information is OFF (SDR-TV), the reference level is not applied.

CINEZONE® - HDR

MaxCLL – Maximum Content Light Level / MaxFALL – Maximum Frame Average Light Level



Thus, allowing review of HDR content without having to rely on an expensive Reference Monitor

Supports PQ, HLG, Slog-3, C-Log and Log-C

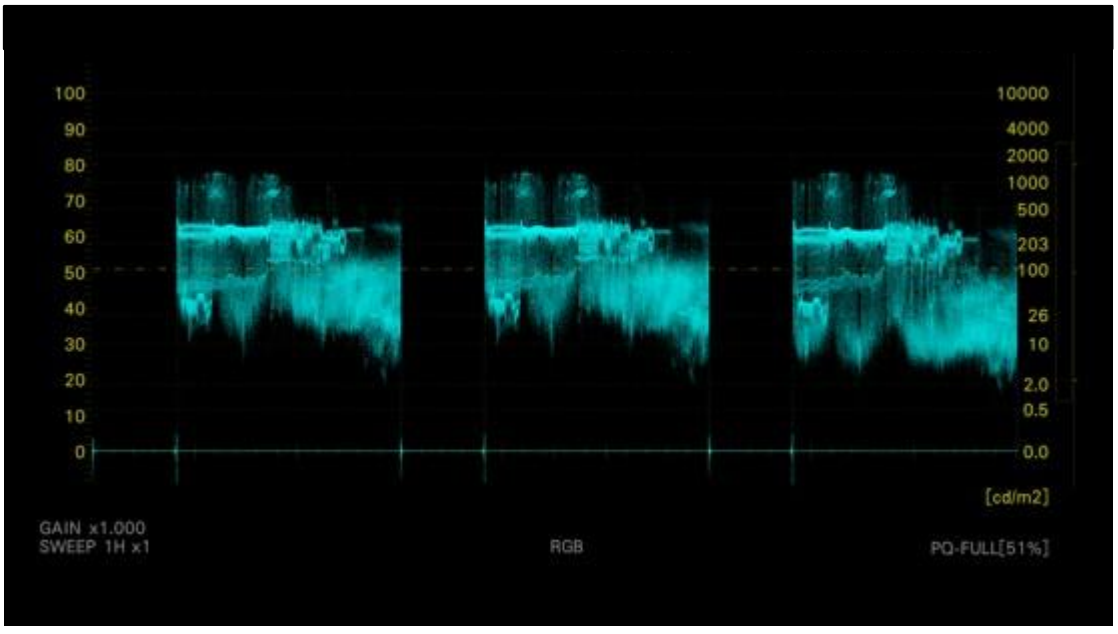
Requires SER23

CINEZONE HDR display

Any part of the image that appears in monochrome is standard dynamic range. Any part of the image that appears **blue** through to **red** is within the high dynamic range area. Any **purple** regions are over-exposed and even an HDR monitor will clip these images.

With more and more productions now being delivered in HDR, having test and measurement tools on set that can easily and quickly identify potential HDR issues is vital if you are not to incur expensive additional hours in post-production correcting the mistakes.

The HDR graticules are also displayed on the waveform monitor display.



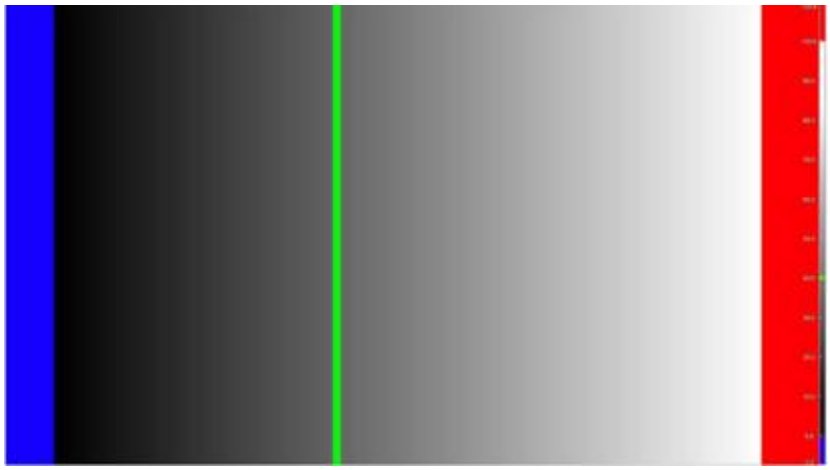
HDR display waveform display

CINESEARCH

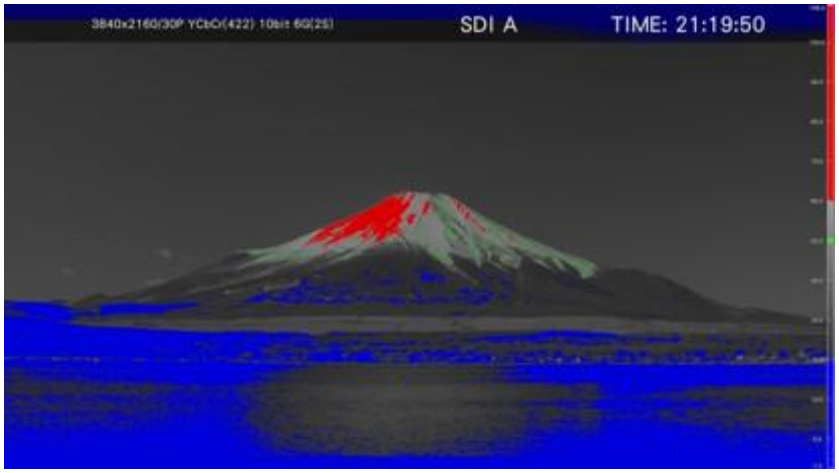
With more and more productions now acquiring in 4K/UHDTV resolutions as well as using log-based gamma curves for HDR production, CINESEARCH enhances on-set production by allowing fine adjustment of luminance levels within a frame with a high degree of accuracy.

All content within plus or minus 0.5% of a user-selected luminance level is portrayed in green over a monochrome equivalent of the full-color original. Any areas of the image exceeding a user-defined maximum threshold are shown in red and anything below the assigned minimum displays as blue, making them very easy to identify.

CINESEARCH can be used to correct luminance far more easily than with a traditional picture monitor or waveform monitor.



User-defined minimum **User-selected luminance level** **User-defined maximum**



20% **50%** **60%**

CINESEARCH Display

Color and Gamut

Gamut is the range of coolers allowed for a video signal.

A legal signal stays within the voltage limits specified for all signal channels for a given format. The allowed range for RGB channels is 0 to 700 mV, while allowed ranges for YPbPr are 0 to 700 mV for the luma (Y) channel, and ±350 mV for the color difference (PbPr) channels.

Valid color gamut is defined as all colors represented by all possible combinations of legal values of an RGB signal. Signals in other formats may represent colors outside valid gamut, but still remain within their legal limits. These signals, when transcoded to RGB, will fall outside the legal RGB limits. This may lead to clipping, crosstalk, or other distortions.

A **valid** signal will remain legal when translated to RGB or other formats. A valid signal is always legal, but a legal signal is not necessarily valid. Signals that are not valid will be processed without problems in their current format but may encounter problems when translated into another format.

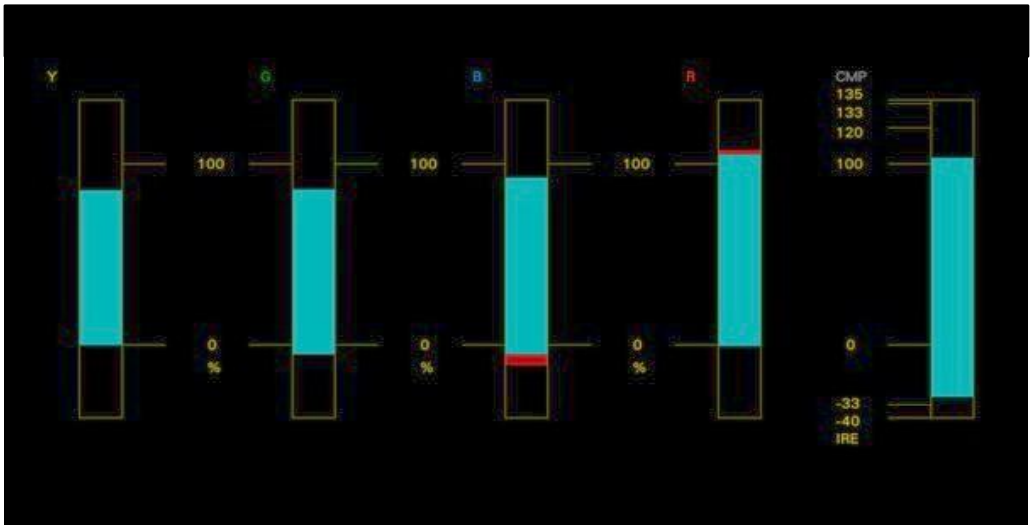
Understanding gamut errors: Camera sensors pick up information in RGB form. Our monitors and even our home TV systems also display the information on their display in RGB form. However, our studios and transmission systems use YPbPr in order to process our work. There are several reasons why we convert our RGB information to YPbPr for processing. YPbPr reduces unwanted color detail and effectively dedicates more bandwidth to the luminance channel where detail is best appreciated by the audience. Also, it is easier and less demanding to build systems processing YPbPr.

It is this conversion issue between RGB and YPbPr that makes it imperative to monitor not only YPbPr but also the RGB channels. As it works out, there are legal value combinations in YPbPr that result in illegal RGB values (over or under range). This results in a particular color (any combination of RGB) being clipped either at the lows or highlights and creates serious unwanted artefacts.

The Leader five-bar display shows YRGB levels as well as Y+C levels, allowing easy RGB and composite gamut monitoring. Levels are user selectable, and the instrument logs timecode referenced errors. It is necessary to monitor not only YPbPr but also RGB levels during production. The reasons were previously explained above in the section titled: *Understanding gamut errors*.

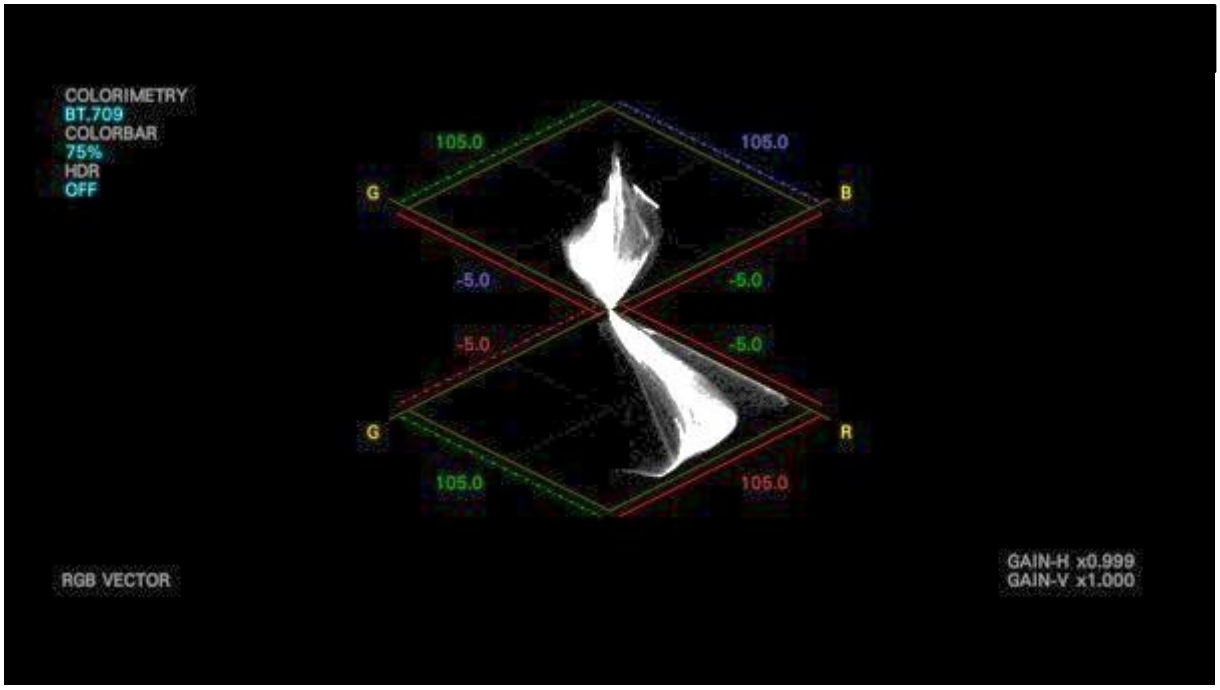
Gamut error detection is essential otherwise production material will most likely not be useable.

In the 5-bar display, the YCbCr signal is converted into GBR or pseudo-composite signal and the peak level of the converted signal's YGBR and CMP (composite) component are displayed simultaneously using five bars.



The 5-bar display can be set up to display EBU R103 tolerances

- **Y** Levels that fall outside of the range that you set using Luminance Upper and Luminance Lower on the status menu are displayed in red.
- GBR Levels that fall outside of the range that you set using Gamut Upper and Gamut Lower on the status menu are displayed in red.
- CMP Levels that fall outside of the range that you set using Composite Upper and Composite Lower on the status menu are displayed in red.



The YCbCr Vector display can be set up to display EBU R103 tolerances

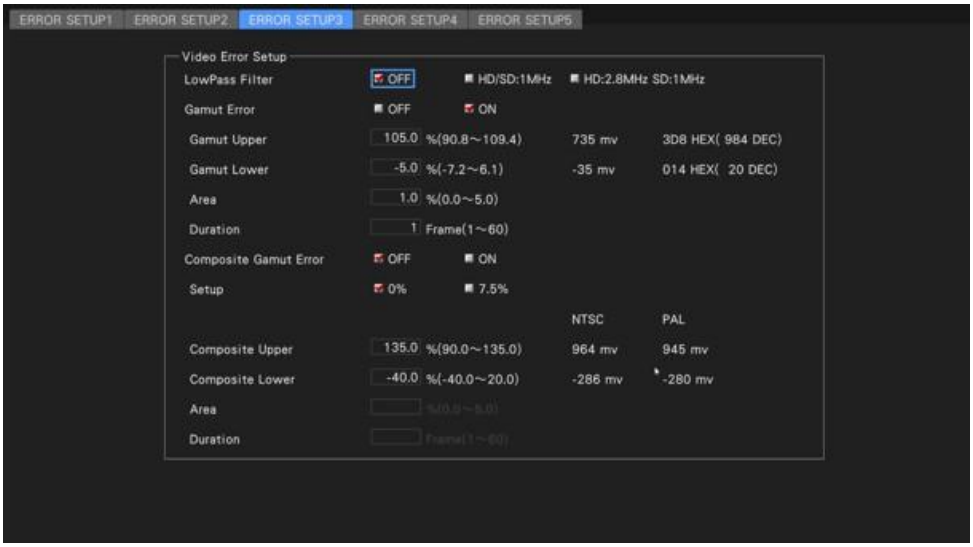
The EBU R103 limits are displayed by dotted Red, Green and Blue lines around the outside of the two diamonds. If the video signal exceeds those limits, the dotted line change color to **RED** and become solid lines.

The five-bar display can be set to measure %, mV, hex and decimal values.

EBU R103 (Video Signal Tolerance in Digital Television Systems) specifies a range in digital sample (code) values.

System Bit Depth	Range in Digital Sample (Code) Values		
	Expected Video Range	Preferred Min. / Max.	Total Video Signal Range
8 bit	16 - 235	5 - 246	1 - 254
10 bit	64 - 940	20 - 984	4 - 1019
12 bit	256 - 3760	80 - 3936	16 - 4079
16 bit	4096 - 60160	1280 - 62976	256 - 65279

https://tech.ebu.ch/docs/r/r103.pdf



The five-bar display can be set up to display EBU R103 tolerances

Extended Gamut Display

To complement the five-bar display, Leader has also developed an on-picture gamut display that shows in real-time where gamut violations are occurring.

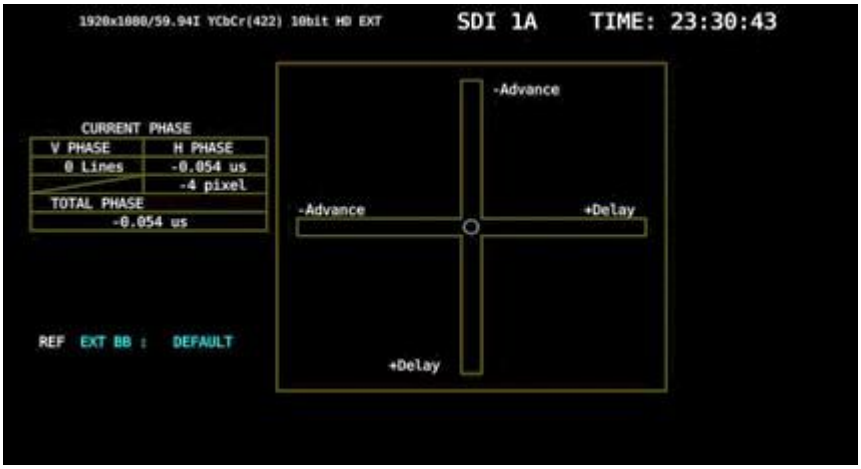
'Real-time' False color Gamut error display

When used in conjuncture with the multi-viewer display to simultaneously display five-bar, status, vector scope and on-picture gamut, operators can easily and quickly identify why gamut errors are occurring and how to correct them.

Multi 'Real-time' False color Gamut error display

Measurement of external sync signal

In multi-camera productions, not only do the cameras have to match but also timing is critical when the recordings return to postproduction.



Phase difference measurement display

The phase difference measurement display can be configured to measure the phase difference between an SDI signal and an external sync signal or the phase difference between a pair of SDI signals.

The vertical axis represents the V phase difference in lines. The horizontal axis represents the H phase time difference. When the circles that represent V and H overlap with each other in the center, there is no phase difference.

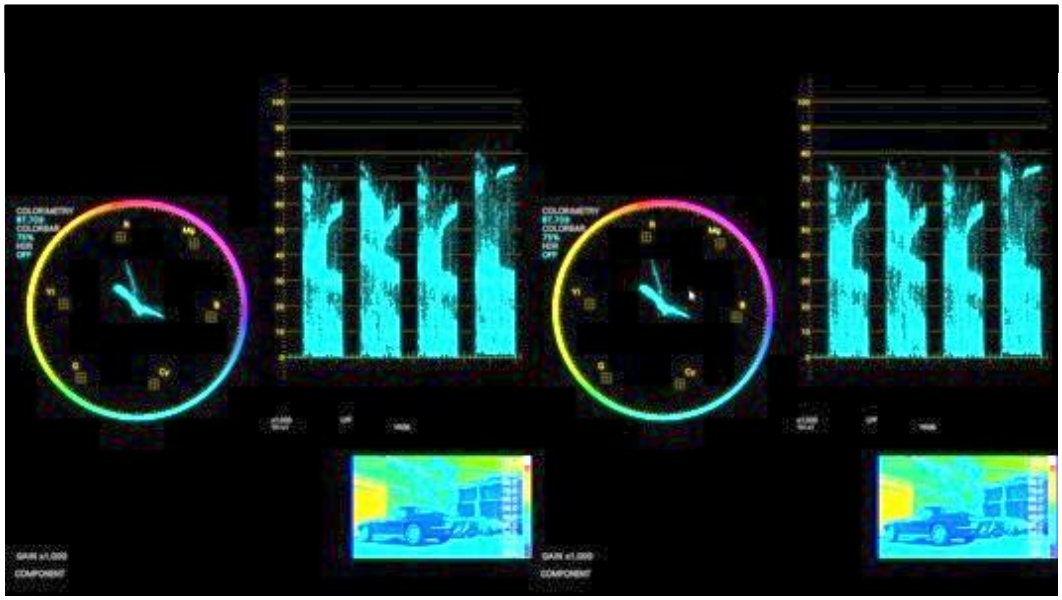
AV delay (lip-sync) error measurement

Leader scopes also feature audio/video delay measurement so DITs and production sound mixers can ensure that the audio and video are correctly synchronized on set.

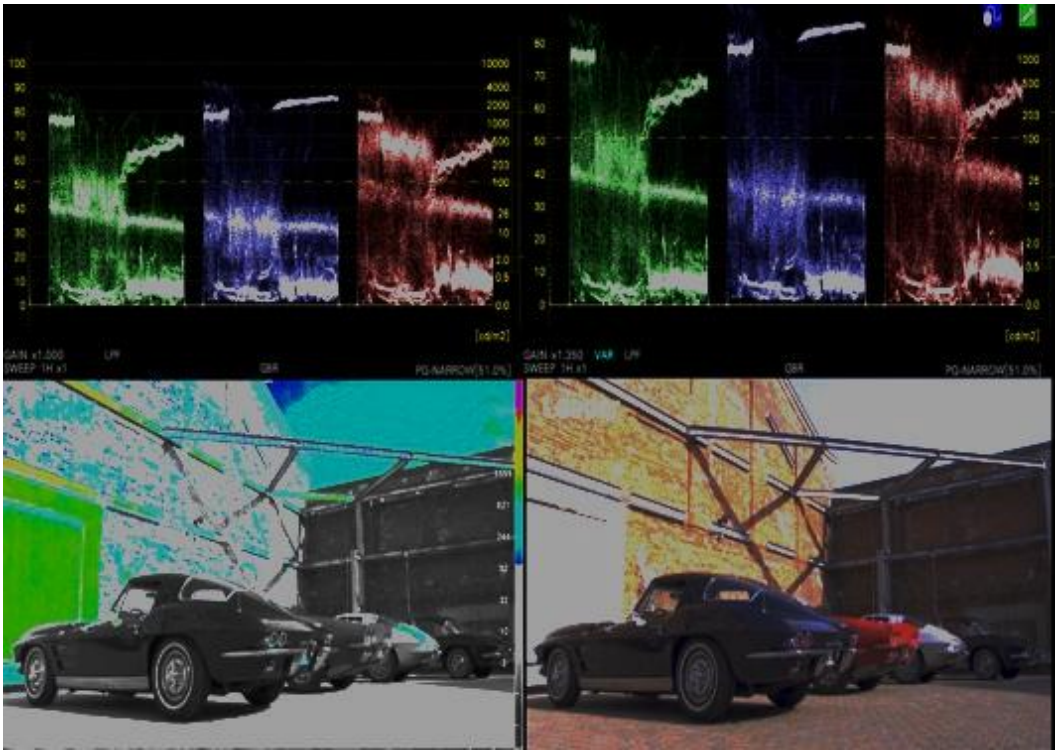
Audio/video delay display

Simultaneous picture monitoring

In multi-camera productions, the ability to simultaneously monitor multiple cameras is extremely useful. The Leader scopes allow two cameras to be monitored simultaneously side-by-side, allowing easy camera matching adjustments.



Multi-camera on-set monitoring



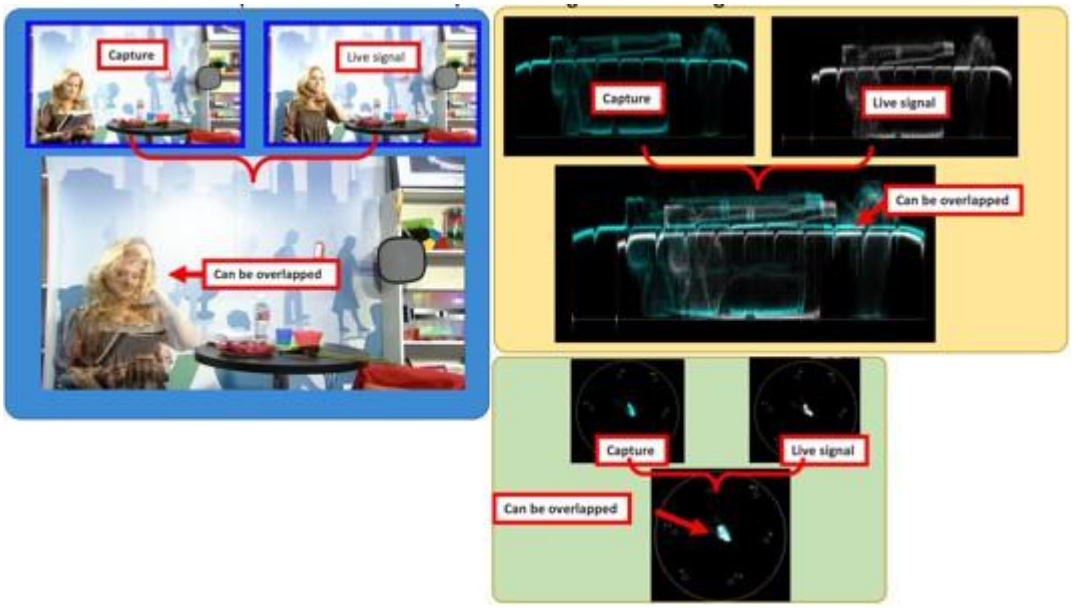
Multi-camera on-set monitoring HDR and SDR

Capture

All Leader ZEN Series products support the ability to be able to capture a screenshot of the display and save it on a USB memory stick.

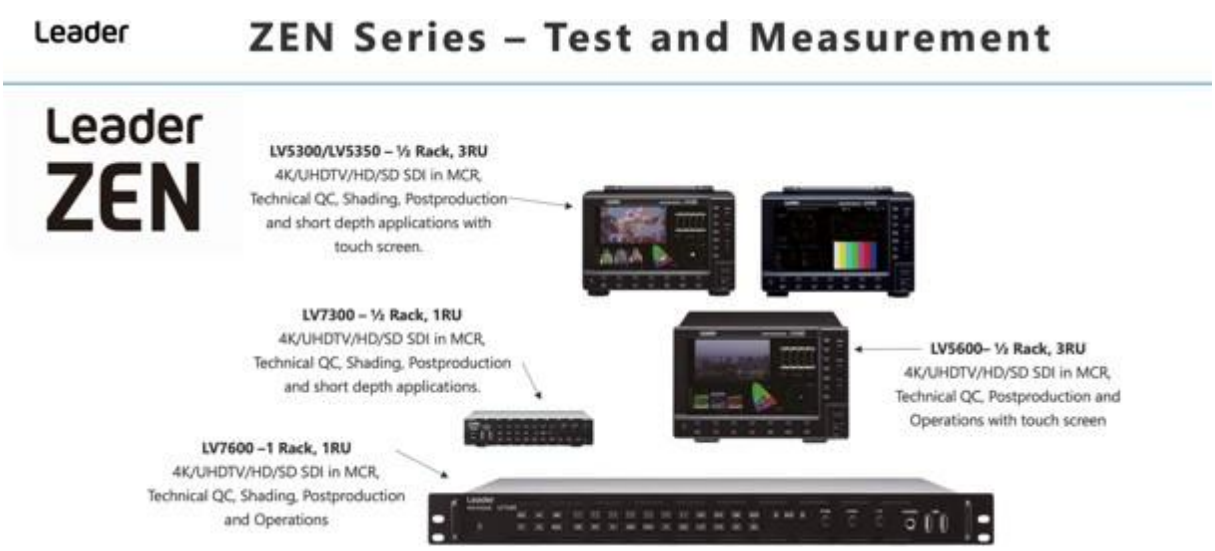
This feature is extremely useful when it comes to sharing setup of the cameras and images between production units.

All Leader ZEN Series products support the ability to be able capture and display an image whilst overlaying the real-time image. This feature is supported on the Picture, Waveform and Vector scope display.



Leader ZEN series – LV5350 Waveform Monitor

The Leader LV5350 Waveform monitor is part of the Leader ZEN Series family of waveform monitors and rasterizers.

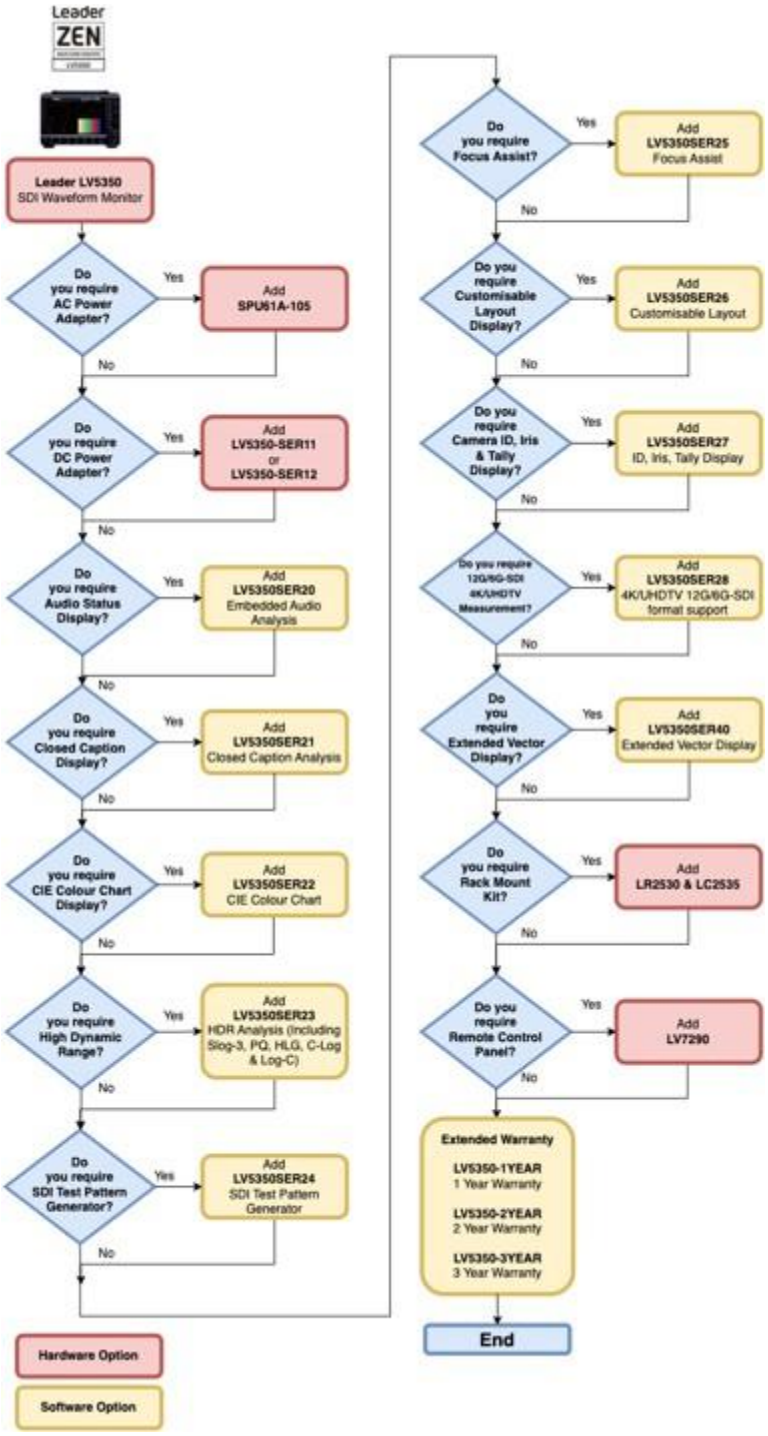


Leader ZEN Series Family

All ZEN Series products support 3G/HD/SD-SDI operation as standard and can be upgraded to support 4K/UHDTV, 12G/6G-SDI, HDR and customizable layout by a software license upgrade.

All ZEN Series products feature the same test and measurement tools and operation, so for a DIT and DoP using a LV5350 On-set, you have the reassurance that the waveform, vector scope and pictures that you are seeing On-set will be the same as those seen by the postproduction company who are using the Leader LV5600 Waveform monitor / LV7600 Rasterizer, to handle the delivery of finished program.

LV5350 Waveform Monitor – Ordering Guide



Leader Zen Series – LV5300A/LV5350 Hardware Options

V-Mount Battery Adapter (SER11)

Description	LV5350
AC Adapter	GST90A12
Battery Adapter	LV5350-SER11 *(V Mount*

AC Adapter

QR Gold Battery Adapter (SER12)

Description	LV5350
AC Adapter	GST90A12
Battery Adapter	LV5350-SER12 *(QR Gold)*

AC Adapter

Rack Mount-Kit (LR2530 & LC2535)

Description	LV5350
Rack-mount Adapter and Blanking Panel	LR2530 & LC2535

LV5350
WAVEFORM MONITOR
4K 12G-SDI 3G-SDI HD-SDI
SD-SDI

Leader Zen Series – LV5300A/LV5350 Software Options

Audio Analysis (SER20)

The LV5350 supports analysis of 8ch of embedded audio. The SER20 Audio software license enables Lissajous display, surround sound display, status, detection of mute and clip errors and AV Lip-sync.

Audio Analysis (SER20 software license option)

CIE Color Chart (SER22)

The CIE color chart was previously only available on Leader's high-end scopes, but this feature is now available on the LV5300/LV5350 and LV7300 as software license upgrade SER22.

With more and more productions capturing content in BT.2020 color space, being able to monitor the camera setting on set is becoming more critical. The Leader scope can now display the color space the producer is working in.

CIE color chart (SER22 software license option)

HDR Analysis (SER23)

The HDR analysis supports level monitoring of the HLG, and PQ defined in ITU-R BT.2100 as well as S-Log3, C- LOG, and Log-C compatible HDR signals. Level control is possible based on the estimated brightness (nits, cd/m2) of a display taking the OOTF into consideration.

Video signal waveform display supports IRE scale as well as HDR scale. On CINEZONE display, the SDR area is displayed in monochrome, while the HDR area is displayed using colors corresponding to the brightness. This makes it easy to view the brightness distribution in the HDR area.

Furthermore, you can display the MAX FALL and MAX CLL compliant with CEA-861.

HDR Analysis (SER23 software license option)

SDI Test Pattern Generator (SER24)

The SDI Test Pattern Generator software license (SER24) enables the LV5350 to output a selection of SDI test patterns

SDI Test Pattern Generator (SER24 software license option)

Focus Assist (SER25)

The Focus Assist software license (SER25) utilizes a new focusing algorithm based on nonlinear super-resolution technology that has been developed to allow highly sensitive focusing even on low-contrast images that were difficult to focus on small On-set HD monitors.

The focus assist display makes it easy to verify the focus by highlighting the image according to the number of detected edges.

Focus Assist (SER25 software license option)

Customizable Layout (SER26)

With the increased demands HDR production is placing on DITs, Leader scopes now include a customizable layout software license option that allows multiple measurement tools to be positioned and resized on the display as per the on-set production requirements.

Customized HDR layout (SER26) – featuring CIE color chart, vector scope, waveform and CINEZONE HDR picture display

12G/6G-SDI Analysis (SER28)

Add support for 4K/UHDTV resolution analysis via 12G/6G-SDI.

4K/UHDTV 12G/6G-SDI Analysis (SER28 software license option)

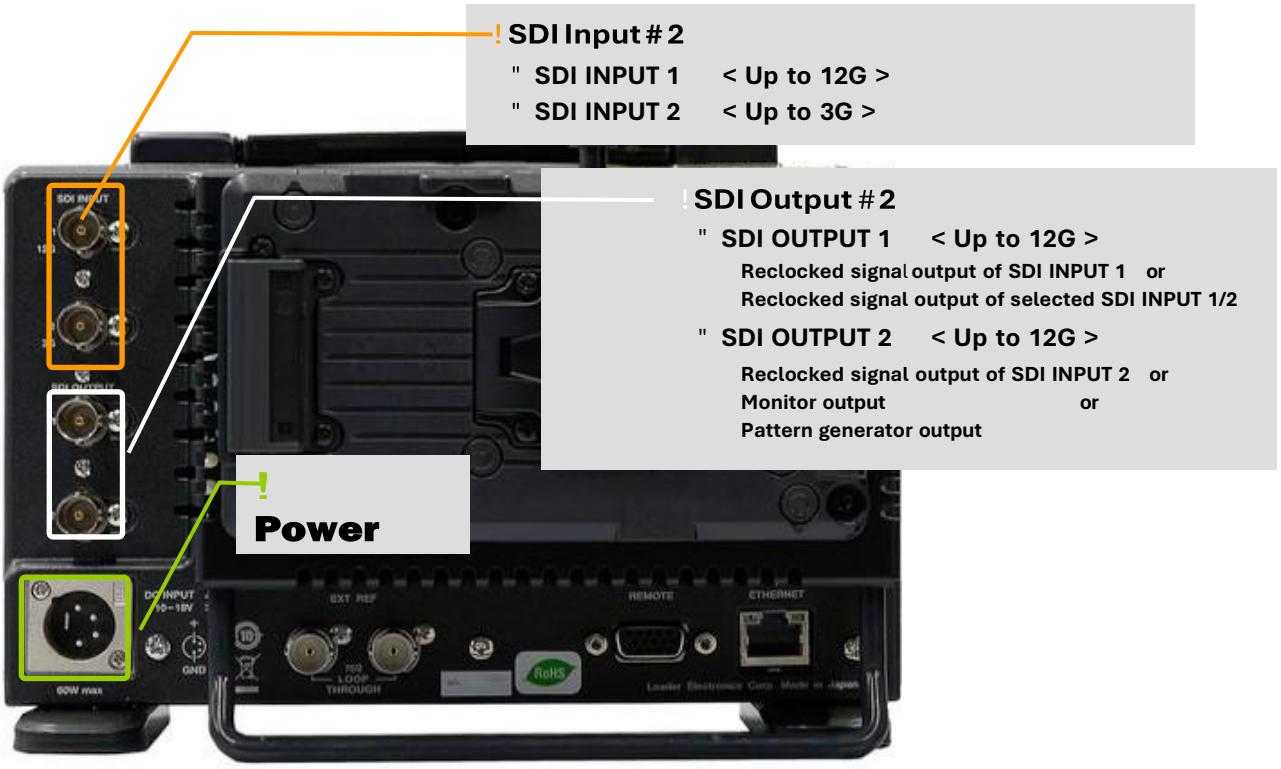
Extended Vector Display (SER40)

Add support for RGB Vector and YCbCr Vector Display.

Extended RGB Vector and YCbCr Vector Display (SER40 software license option)

Monitor Display Outputs – LV5300A/LV5350

As well as featuring re-clocked loop-through outputs of both inputs for On-Set monitoring of the cameras.



SDI Output 2 can be switched to provide a monitor display output of the waveform monitor display